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High Dependency Care provision in Obstetric Units remote from tertiary referral centres and factors influencing care escalation: A mixed methods study

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**High Dependency Care provision in Obstetric Units remote from tertiary
referral centres and factors influencing care escalation:
A mixed methods study**

Submitted by

Alison James

A thesis submitted to Plymouth University
in partial fulfilment for the degree of

DOCTOR OF PHILOSOPHY

March 2017

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Dedicated to those who were present at the start of my PhD studies but are sadly no longer with us and so greatly missed:

Peter Collins, Mabel James, my dear sister Karenza James (PhD, FRCS).

Author's Declaration and Word Count

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Graduate Sub-Committee. Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment. The fees for this study have been paid by Plymouth University.

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Glossary of Terms

Alanine aminotransferase	A liver function test. ALT is found in cytoplasm of liver and myocardial cells and released when cell damage occurs. Raised in pre-eclampsia.
Alongside Maternity Unit	Maternity unit that is on the same site as an Obstetric Unit but separate. Staffed by midwives and maternity care assistants.
Anaesthetist	Medical specialist who has undertaken rigorous education and training over the course of seven years in the UK. Range of practice includes anaesthesia for surgery, intensive care management, obstetrics and pain management.
APACHE II or APACHE III (J)	The Acute Physiology and Chronic Health Evaluation system allocates points for twelve physiological measurements, age and chronic health status and these objective measures combined are used to predict patient morbidity and mortality. APACHE II has a maximum score of 71. APACHE III (J) is a modified version (Vincent and Moreno, 2010).
Aspartate aminotransferase	Liver function test. Often abbreviated to AST this is found in the mitochondria of tissue and released when inflammation / cell damage occurs.
Auditability	The extent to which the audit trail is described by the researcher. This enables the reader to understand how the researcher arrived at the themes and categories from the raw data (Rees 1997).
Case mix	“The range and types of women looked after by the maternity services” (Smith & Dixon, 2008, p.vi)
Cardiotocograph	Electronic means of monitoring the fetal heart (cardio) and uterine contractions (toco) using transducers. The fetal heart is either monitored using an abdominal transducer or an electrode is placed directly on the fetal scalp.
Credibility	Term used in qualitative research to describe the trustworthiness of qualitative findings or the confidence placed in them.
Comorbidity	The presence of a disorder additional to pregnancy
Confirmability	Neutrality of findings in qualitative research. The researcher has not imposed his / her own biases on the process.

Freestanding Maternity Unit	A unit situated away from the OU, staffed by midwives / maternity care assistants. Midwives provide care for healthy women with straightforward pregnancies in this type of unit.
Hemocue	Device used for point of care testing for haemoglobin and haematocrit levels. Often used in major obstetric haemorrhage situations.
Intensivist	Medical specialist who has undertaken rigorous education and training over the course of seven years in the UK. Responsible for the provision of critical care. Leads a team of caregivers to provide level three care. Alternatively, termed Critical Care Physician.
Mean Corpuscular Volume	Often abbreviated to MCV this is the average volume of the red blood cell. This will alter where there are different types of anaemia or other medical problems
Obstetrician	Medical specialist who has undertaken rigorous education and training over the course of seven years. Range of practice includes care of the pregnant woman from conception through to the puerperium, and includes medicine and surgery. Many have a special interest e.g. high risk obstetrics, fertility care, fetal medicine.
Postnatal period	“The time after the end of labour during which the attendance of a midwife upon a woman and baby is required, being not less than 10 days and for such longer period as the midwife considers necessary” (NMC, 2012, p.6)
Registered Midwife	“The midwife is recognised as a responsible and accountable professional who works in partnership with women to give the necessary support, care and advice during pregnancy, labour and the post-partum period, to conduct births on the midwife’s own responsibility and to provide care for the newborn and the infant. This care includes preventative measures, the promotion of normal birth, the detection of complications in mother and child, the accessing of medical care or other appropriate assistance and the carrying out of emergency measures” (NMC, 2009, p.4)
Severe Maternal morbidity (SMM)	Alternatively named ‘maternal near miss’ or ‘acute severe maternal morbidity’, this is broadly defined as a severe complication which is potentially life threatening (Baskett & O’Connell, 2005; Bewley, Wolfe & Waterstone, 2002; Mantel et al., 1998; Say, Souza & Pattinson, 2009)

Supervisor of Midwives	Often abbreviated to SoM, this is a midwife appointed by a local supervising authority to exercise supervision over midwives practicing in its area. SoMs currently have a statutory function and their primary function is to maintain the safety of the mother and baby.
Therapeutic Intervention Scoring System (TISS)	A 76 or 28 item validated scoring tool used to classify a patient according to the number of therapeutic interventions received (Vincent & Moreno, 2010)
Tocolytic	A medication administered to suppress pre term labour such as nifedipine.

Abstract

High Dependency Care provision in Obstetric Units remote from tertiary referral centres and factors influencing care escalation: A mixed methods study

Background

Due to technological and medical advances, increasing numbers of pregnant and post natal women require higher levels of care, including maternity high dependency care (MHDC). Up to 5% of women in the UK will receive MHDC, although there are varying opinions as to the defining features and definition of this care. Furthermore, limited evidence suggests that the size and type of obstetric unit (OU) influences the way MHDC is provided. There is robust evidence indicating that healthcare professionals must be able to recognise when higher levels of care are required and escalate care appropriately. However, there is limited evidence examining the factors that influence a midwife to decide whether MHDC is provided or a woman's care is escalated away from the OU to a specialist unit.

Research Aims

1. To obtain a professional consensus regarding the defining features of and definition for MHDC in OUs remote from tertiary referral units.
2. To examine the factors that influence a midwife to provide MHDC or request the escalation of care (EoC) away from the OU.

Methods

An exploratory sequential mixed methods design was used:

Delphi survey: A three-round modified Delphi survey of 193 obstetricians, anaesthetists, and midwives across seven OUs (annual birth rates 1500-4500) remote from a tertiary referral centre in Southern England. Round 1 (qualitative) involved completion of a self-report questionnaire. Round 2/3 (quantitative); respondents rated their level of agreement or disagreement against five point Likert items for a series of statements. First round data were analysed using qualitative description. The level of consensus for the combined percentage of strongly agree / agree statements was set at 80% for the second and third rounds

Focus Groups: Focus groups with midwives across three OUs in Southern England (annual birth rates 1700, 4000 and 5000). Three scenarios in the form of video vignettes were used as triggers for the focus groups. Scenario 1; severe pre-eclampsia, physiologically unstable 2; major postpartum haemorrhage requiring invasive monitoring 3; recent admission with chest pain receiving facial oxygen and continuous ECG monitoring. Two focus groups were conducted in each of the OUs with band 6 / 7 midwives. Data were analysed using a qualitative framework approach.

Findings

Delphi survey: Response rates for the first, second and third rounds were 44% (n=85), 87% (n=74/85) and 90.5% (n= 67/74) respectively. Four themes were identified (conditions, vigilance, interventions, and service delivery). The respondents achieved consensus regarding the defining features of MHDC with the exceptions of post-operative care and post natal epidural anaesthesia. A definition for MHDC was agreed, although it reflected local variations in service delivery. MHDC was equated with level 2 care (ICS, 2009) although respondents from the three smallest OUs agreed it also comprised level 1 care. The smaller OUs were less likely to provide MHDC and had a more liberal policy of transferring women to intensive care. Midwives in the smaller OUs were more likely to escalate care to ICU than doctors.

Focus Groups: Factors influencing midwives' EoC decisions included local service delivery, patient specific / professional factors, and guidelines to a lesser extent. 'Fixed' factors the midwives had limited or no opportunity to change included the proximity of the labour ward to the ICU and the availability of specialist equipment. Midwives in the smallest OU did not have access to the facilities / equipment for MHDC provision and could not provide it. Midwives in the larger OUs provided MHDC but identified varying levels of competence and used 'workarounds' to facilitate care. A woman's clinical complexity and potential for physiological deterioration were influential as to whether MHDC was assessed as appropriate. Midwifery staffing levels, skill mix and workload (variable factors) could also be influential. Differences of opinion were noted between midwives working in the same OUs and varying reliance was placed on clinical guidelines.

Conclusion

Whilst a consensus on the defining features of, and definition for MHDC has been obtained, the research corroborates previous evidence that local variations exist in MHDC provision. Given midwives from the larger OUs had variable opinions as to whether MHDC could be provided, there may be inequitable MHDC provision at a local level. Organisationally robust systems are required to promote safe, equitable MHDC care including MHDC education and training for midwives and precise EoC guidelines (so workarounds are minimised). The latter must take into consideration local service delivery and the 'variable' factors that influence midwives' EoC decisions.

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Chapter 1 Introduction

1.0 Introduction

Maternity services in the United Kingdom (UK) promote pregnancy and childbirth as a normal life event, with the aim of promoting women's physical and psychological wellbeing (Chief Nursing Officers of England Northern Ireland Scotland and Wales, 2010). However, a proportion of women will develop complications that are unique to pregnancy and these include pre-eclampsia, HELLP syndrome (Haemolysis, Elevated liver enzymes and Low Platelets), acute fatty liver of pregnancy, obstetric cholestasis, gestational diabetes mellitus, placental abruption and placenta praevia, amniotic fluid embolism and peripartum cardiomyopathy (Arulkumaran & Lightstone, 2013; Lyall & Belfort, 2007; Soubra, Kalapalatha & Guntupalli, 2005). Other women may suffer clinical deterioration related to pre-existing conditions such as cardiac disease and diabetes during the antenatal, intrapartum and postnatal periods (Centre for Maternal and Child Enquiries, 2011; Lewis, 2007).

Women who experience obstetric complications or who have comorbidities are classified as having 'high risk' or 'complex' pregnancies and have the potential to suffer severe maternal morbidity or mortality (Knight et al., 2014; Vaughan et al., 2010). Comorbidities include haematological, autoimmune, cardiac, and endocrine disorders such as diabetes, neurological disorders such as epilepsy, respiratory disorders, hypertensive disorders and gastrointestinal disease (Billington & Stevenson, 2007; Brooks, 2011; Guy, Kirumaki & Hanania, 2004; James et al., 2011; National Institute for Health and Care Excellence, 2008 (updated 2016)). A recent un-matched case control study examining factors associated with maternal death in the UK concluded that the presence of a comorbidity was associated with an increased risk of maternal death (OR 4.82, 95% CI 3.14-7.40) (Nair et al., 2015). Similar inferences have been drawn from a

large retrospective audit conducted in the USA, using Nationwide Inpatient Sample data (Mhyre, Bateman & Leffert, 2011).

Historically some women with pre-existing medical conditions would have been unable to conceive, but are now able to do so because of medical advances (Robson & Waugh, 2013). As a result, the number of pregnant women with pre-existing medical disorders is increasing and this has an impact on the numbers of women who require higher levels of care (Billington & Stevenson, 2007; James *et al.*, 2011).

Women who become acutely ill during pregnancy or the intrapartum / postnatal periods may be transferred to an intensive care unit (ICU) for complex treatments including organ system monitoring and support (Bench, 2007; Maternal Critical Care Working Group, 2011). Alternatively, some women may receive care on a general high dependency unit (HDU), a specialist area such as coronary care, and some will remain on the labour ward and receive high dependency care (Rawal *et al.*, 2008; Sultan, Arulkumaran & Rhodes, 2013). Throughout this thesis, the term Maternity High Dependency Care (MHDC) is used to refer to the concept of high dependency care provision on the labour ward (Goebel, 2004; Maternal Critical Care Working Group, 2011; Ryan *et al.*, 2000). A number of alternative terms may be found in the literature and include; 'obstetric high dependency care', 'maternal' or 'labour ward' intensive / critical care, 'intermediate care' and 'maternal high dependency care' and (more recently), level one and two care (Baskett, 2008; Billington & Stevenson, 2007; Hardy, 2013; Lee, 2000; Rajagopal *et al.*, 2011; Sultan, Arulkumaran & Rhodes, 2013; Van Parys *et al.*, 2010; Vaughan *et al.*, 2010; Wheatly, 2010; Zeeman, Wendel & Cunningham, 2003)

MHDC has been positively evaluated in terms of bringing the requisite obstetric and critical care expertise together and promoting continuity of care for women and their families (Anthony & Johanson, 1996; Ryan *et al.*, 2000; Saravanakumar *et al.*, 2008). Access to MHDC in Obstetric Units (OUs) is crucial given the increasing numbers of women classed as having 'high risk' pregnancies (Bench, 2007; Cheng & Raman, 2003; Knight *et al.*, 2014; Zeeman, 2006). However, in order for women to receive MHDC they require appropriate and timely care escalation (Centre for Maternal and Child Enquiries, 2011; National Patient Safety Agency, 2007). The escalation of care (EoC) is defined as:

"Any significant unplanned increase in the level of care provided to the patient and includes such outcomes as unplanned intensive care unit admission" (Posner & Freund, 2004, p.438).

In the context of midwifery practice, the EoC may occur when a woman's clinical condition requires a higher level of care (e.g. ICU or MHDC) during pregnancy, labour, and / or the postnatal period. The term 'failure to rescue' is used when care escalation does not occur in response to clinical deterioration in a timely manner and adverse clinical outcomes arise as a consequence (Mackintosh & Sandall, 2010). Alternative expressions for the term 'adverse outcome' include 'maternal near miss' and 'severe maternal morbidity', although these terms are also used to describe adverse outcomes such as severe haemorrhage where health system failures did not occur (Baskett & O'Connell, 2005; Filippi *et al.*, 1998; Pallasmaa, Ekblad & Gissler, 2008; Say, Souza & Pattinson, 2009).

This thesis will examine the concept of MHDC, specifically in OUs remote from a tertiary referral centre, and the factors that influence midwives to either provide MHDC or escalate care away from the OU. The current chapter provides an overview of the organisation of maternity services in England and in so doing, places the research

examining MHDC and the EoC in context. The background to the research undertaken, the rationale for, aims, objectives and significance of the research are also presented.

1.1 Organisation of maternity services in England

In 2013, the number of live births in England and Wales was 698,512 (Office for National Statistics, 2014) and currently the National Health Service (NHS) maternity services in England and Wales provide intrapartum care for the majority of these women. A survey conducted in 2007 (and repeated using a subset of the original survey questions in 2010) examined the configuration of maternity services across England (Redshaw et al., 2011). Intrapartum care was identified as being available to women in the home setting, Freestanding Midwifery Units (FMUs), Alongside Midwifery Units (AMUs) and OUs.

Midwives are the primary care providers in FMUs and AMUs providing care for women who are assessed as having low risk pregnancies and labours. They will also provide care for all women requiring admission to an OU. An OU is defined as;

“An NHS clinical location in which care is provided by a team, with obstetricians taking primary responsibility for women at high risk of complications during labour and birth. Midwives offer care to all women in an OU whether or not they are considered high or low risk, and take primary responsibility for women with straightforward pregnancies during labour and birth. Diagnostic and treatment medical services, including obstetric, neonatal and anaesthetic care are available on site” (Redshaw, 2011, p.2).

In addition to midwives, OUs are staffed with obstetricians, anaesthetists, paediatricians / neonatologists, support staff and managers. Different models of maternity care provision are evident with some providing midwife-led continuity of care for women irrespective of their risk status, where named midwives provide care

throughout pregnancy, labour and the postnatal period (Sandall, 2013). In contrast, other models follow more traditional patterns with different groups of midwives providing the OU and community based care (Sandall et al., 2016). The local arrangement of these services is governed by funding, local, and national policy, the local case mix, geographical location and trends in the local birth rate (Redshaw *et al.*, 2011).

A proportion of Acute NHS Trusts will have OUs classed as regional or national centres of excellence (referred to as Specialist NHS Trusts or Tertiary referral centres). Tertiary referral centres provide care for women with comorbidities (Department of Health, 2015). Acute Trusts may be classified as small, medium or large, and many medium and larger Trusts will be affiliated with universities and designated as teaching hospitals. The terminology relating to the annual birth rate of OUs is variable. Obstetric Units have been categorised according to obstetric staffing requirements (Royal College of Anaesthetists et al., 2007; Royal College of Obstetricians and Gynaecologists, 2013) and also by description (Cordingley & Rubin, 1997), as shown in Table 1-1.

Annual Birth Rate	Category for Obstetric staffing levels	Description
≤2500	'A' unit	'Support relatively few births' Low volume or small
2500-4000	'B' Unit	'Smaller' unit
> 4000- 5000	C1 Unit	'Larger' unit
> 5000 ≤ 6000	C2 Unit	OUs supporting 'large numbers of births' High Volume Unit
> 6000 births	C3 Unit	High Volume Unit

Table 1-1 Classification of Obstetric Units by annual birth rate

Sources (Cordingley & Rubin, 1997; Royal College of Anaesthetists et al. 2007; Royal College of Obstetricians & Gynaecologists, 2013)

Obstetric Units associated with larger Acute Trusts will provide specialist neonatal services i.e. Neonatal Intensive Care Units (NICUs) or Local Neonatal Units (LNUs) care. Smaller Acute Trusts may offer Special Care Unit (SCU) facilities only. Special Care Units offer special care and / or some high dependency care for neonates (level 1 care) whilst LNUs provide higher levels of neonatal care including short term intensive care (level 2 care); NICUs provide the full range of care levels including prolonged intensive care (level 3 care).

A reorganisation of neonatal services across England has seen the development of managed clinical networks and the regionalisation of NICUs, based on evidence that there are improved outcomes for infants born in units with high volumes of cases and dedicated expertise (Department of Health, 2004; Phibbs, 2012). NICU facilities are affiliated with OUs that deliver specialist obstetric and feto-maternal medicine services, and provide care not only for neonates from the local population, but also for those requiring specialist care from other areas within a local neonatal network (NHS and Department of Health, 2009). Neonates born with level two or three care needs will be transferred from OUs with SCU facilities only, to those with LNUs or NICUs.

Alternatively women with high risk pregnancies whose unborn babies are anticipated to require level three neonatal care will be transferred to centres with NICU facilities prior to birth, a process called in-utero transfer (NHS and Department of Health, 2009). The regionalisation of neonatal care services has not been accompanied by the concurrent regionalisation of maternity services and this has led to calls for the review of maternity service organisation (Gale et al., 2011; Phibbs, 2012). The latest review of maternity service provision in England has advocated the coordinated working of local maternity services through the formation of “clinical networks, coterminous for both maternity and neonatal services...to provide support and to advise about the commissioning of

specialist services which support local maternity systems” (NHS England, 2016a, p.109)

1.2 Maternity High Dependency Care background

The necessity for high dependency care provision in obstetric units was first identified in the late 1980's by the 'Confidential Enquiries into Maternal Death' reports (Wheatly, 2010). In 1996, the Department of Health provided a generic definition for high dependency care;

“A level of care intermediate between that on a general ward and intensive care. High dependency care monitors and supports patients with, or likely to develop acute (or acute-on-chronic) single organ failure. It should not manage patients requiring multiple organ support nor patients requiring mechanical ventilation. High dependency care can act as a ‘step-up’ or ‘step-down’ between the level of care delivered on a general ward and intensive care.”

(Department of Health, 1996, p.6)

In 1999, it was suggested that maternity services should be prepared to care for ‘up to ten high dependency cases for every thousand births’ (Royal College of Midwives and Royal College of Obstetricians and Gynaecologists, 1999). In 2001, 47% of all OUs surveyed in England and Wales had obstetric high dependency units, whilst in the 2000-2002 ‘Why Mothers Die’ report it was stressed that staff in obstetric theatres should be able to initiate invasive monitoring (Lewis, 2004; Thomas & Paranjothy, 2001). The provision of high dependency care for the sick parturient have been instrumental in lowering admission rates to the ICU (Lee, 2000; Mirghani et al., 2004; Ryan et al., 2000; Solberg et al., 2014; Sultan, Arulkumaran & Rhodes, 2013). MHDC also promotes continuity of caregivers during and post birth (Lee, 2000).

Multidisciplinary guidance entitled 'Safer Childbirth' outlined minimum standards for the organisation and delivery of care of women in labour and reiterated that "all obstetric units should be able to provide some high-dependency care" (Royal College of Anaesthetists *et al.*, 2007). The word 'some' in relation to MHDC was not quantified in this report although successive guidance has provided greater detail under the umbrella term of 'maternal critical care' (Maternal Critical Care Working Group, 2011).

The national percentage of women receiving and surviving MHDC is presently unknown. In the UK, accurate information relating to the numbers of women requiring admission to critical care units is available from the Intensive Care National Audit and Research Centre (ICNARC). The rate of obstetric admissions in the UK has been calculated at 2.6 - 2.9 /1000 maternities (Intensive Care National Audit & Research Centre, 2013; Intensive Care National Audit and Research Centre, 2009). This rate reflects the findings of a systematic review calculating the median incidence of pregnant and postpartum women admitted to ICUs internationally at 2.7/1000 deliveries (IQR 1.9-5.4) (Pollock, Rose & Dennis, 2010).

Data collected almost two decades ago in the North Staffordshire area identified that "just under 1%" of women received MHDC (Anthony & Johanson, 1996) whilst more recent surveys suggest that 5% and 4.2% of women respectively, required high dependency care (Hussain *et al.*, 2011; Saravanakumar *et al.*, 2008). The Saravanakumar *et al.* (2008) study collected data retrospectively from Birmingham Women's Hospital over a period of twenty-three years. The overall admission rate to the onsite HDU was 2.67%, but analyses of the most recent data (collected between 2003 and 2007) showed the admission rate increased to 5%.

By contrast, a retrospective study of high dependency admissions on a Scottish labour ward with an annual birth rate of 6000, identified that over an eight month period in 2010, the admission rate was equivalent to 1.8% of all births (Rajagopal *et al.*, 2011). A retrospective observational study conducted in a large Eastern Indian OU revealed a similar high dependency utilisation rate of 1.2 per 1000 births (Dattaray *et al.*, 2013), however differences in healthcare provision and local case mix mean these data are not generalizable to the UK population.

1.3 Escalation of Care

The term 'escalation of care' (EoC) refers to the prevention or treatment of clinical deterioration (Dutton, 2012) and "may involve advice from critical care outreach, ITU and transfer to a higher level of care" (Dutton, 2012, p.17), including the provision of MHDC. A Registered Midwife's professional code states that he/she must "work with colleagues to preserve the safety of those receiving care" and "share information to identify and reduce risk" (Nursing and Midwifery Council (NMC), 2015, p 8). Midwives play an essential role in monitoring women for signs of clinical deterioration and providing care for women classed as high risk in OUs. They must be able to engage in discussions with their professional colleagues and make cognizant judgements about whether an acutely ill woman can receive MHDC or whether EoC away from the OU is required (National Institute for Health and Clinical Excellence, 2007).

1.4 Focus of the research problem

MHDC is a multifaceted entity and the literature suggests there may be variations in service provision across England in terms of available facilities, level and availability of professional expertise, and complexity of the monitoring and treatments (Billington & Stevenson, 2007; Harrison *et al.*, 2005; Lee, 2000; Maternal Critical Care Working

Group, 2011; Royal College of Anaesthetists *et al.*, 2007; Saunders *et al.*, 2013)

(Figure 1-1).

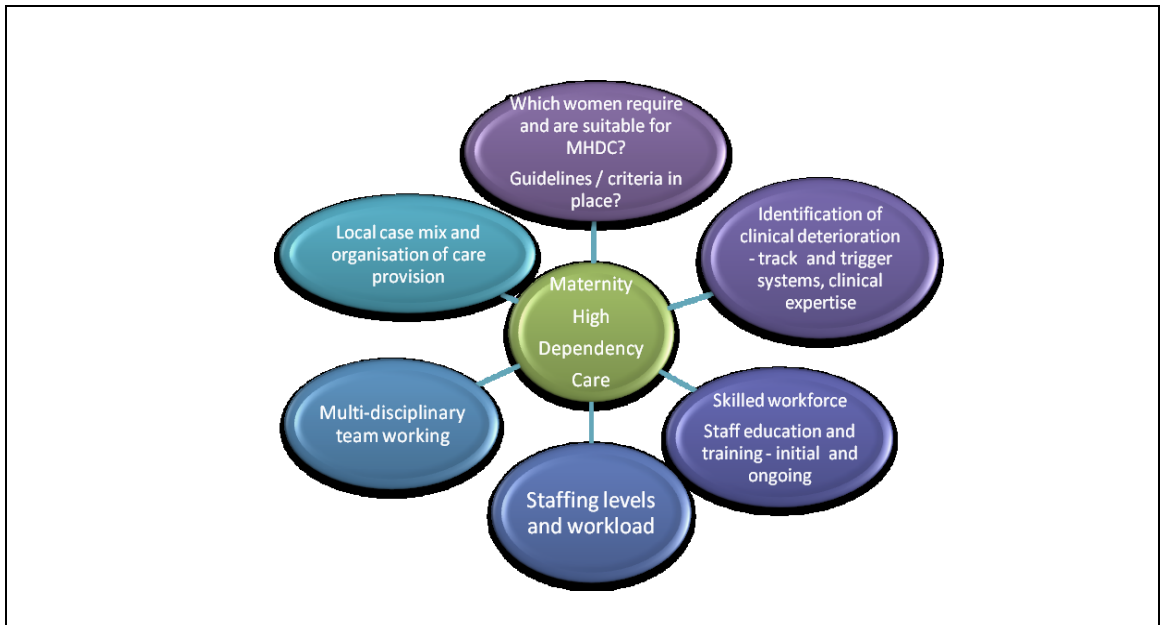


Figure 1-1 Components of MHDC (James, Endacott & Stenhouse, 2011) [Permission to reproduce this Figure has been granted by 'Midwifery' / Elsevier].

Within the hierarchy of evidence as defined by the Joanna Briggs Institute (Joanna Briggs Institute, 2016) several lower level research studies (e.g. observational descriptive types) and book chapters discuss the concept of MHDC. However, to date, no published research has been undertaken examining healthcare professionals' understanding of the concept. Furthermore, no research has explored if midwives, obstetricians, and anaesthetists share the same views about the defining features of MHDC or professional disparity exists. This is an important consideration given that cohesive multidisciplinary team (MDT) working is a vital factor in promoting safe maternity care provision (Martin & Hutchon, 2008; Van de Velde, Scholefield & Plante, 2013). Variations have the potential to cause what Cook, Render and Woods (2000) have termed 'gaps' or "discontinuities in care" which if unnoticed or left unresolved, may eventually lead to the occurrence of adverse clinical incidents. Additionally, there is limited published evidence the defining features and definition for MHDC in OUs that have different annual birth rates.

Thus, the first research question, examined in study phase 1 asked; **‘what constitutes maternity high dependency care in Obstetric Units remote from tertiary referral centres?’**

The second research question arose in response to key findings from the first study phase and the literature and asked; **‘what factors influence midwives to provide MHDC or request the escalation of care away from the OU, at a local level?’**

1.4.1 Aims and objectives of the research

The aims of the research were to:

- i) determine what constitutes MHDC in OUs remote from tertiary referral centres
- ii) examine the factors that influence a midwife to provide MHDC or request the escalation of care away from the OU at a local level.

Aim i, was addressed through the following research objectives:

1. To achieve a consensus on the defining features of MHDC.
2. To obtain a consensus definition for MHDC.
3. To examine whether the defining features of, and definition for MHDC are the same (or differ), for OUs that have differing annual birth rates.
4. To investigate if the defining features of, and definition for MHDC are the same (or differ), for the professional groups of doctors and midwives working in OUs with similar annual birth rates.

Aim ii, was addressed through the following objectives:

1. To determine if local service delivery (e.g. annual birth rate, facilities) has an impact on a midwife’s decision to provide MHDC or request care escalation.
2. To ascertain if patient specific factors (e.g. the presence of comorbidity, clinical stability) influence midwives to provide MHDC or request care escalation.

3. To examine if professional issues (e.g. midwifery expertise, education and training, skill mix) impact upon care escalation decisions.
4. To determine if clinical guidelines and / or other factors influence a midwife's decision to provide MHDC or request the escalation of care.

1.5 Research Design

The research objectives were addressed in two phases. Phase 1 utilised a modified Delphi survey and phase 2 involved a qualitative exploration of the factors influencing midwives to provide MHDC or escalate care away from the OU, using focus groups and a framework analytical approach for data analyses (Gale et al., 2013; Smith & Firth, 2011; Srivastava & Thomson, 2009). The triggers for the focus group discussions were 3 video vignettes and supplementary objective data.

1.5.1 Phase one: Delphi survey

The Delphi survey was used to gain a consensus as to what constitutes MHDC. Delphi surveys are suitable for examining issues where controversy exists, making it applicable with regards the concept of MHDC and the uncertainties surrounding it (Kearney, 2005). The survey was conducted over three rounds, and a modified technique was utilised whereby the statistical results obtained during the second round were not fed back directly to the respondents in round three (Endacott et al. 1999).

The first round of the survey involved the qualitative analysis of data obtained in response to the open-ended research question 'what constitutes MHDC?' All data from the first round were analysed using a generic qualitative approach (Caelli, Ray & Mill, 2003; Cooper & Endacott, 2007). Three of the four emergent themes underpinned the second round questionnaire. The fourth theme informed the second research phase (Focus Groups).

From the Delphi first round themes, categories and subcategories, the second round questionnaire, that consisted of a series 106 statements, was developed. Respondents were asked to rate their level of agreement or disagreement with each of the statements on five point Likert type items, enabling them to consider the views provided by their peers and re-evaluate their own responses. The third round questionnaire evolved from the second round responses.

1.5.2 Phase two: Qualitative study using focus groups

The second research phase evolved in response to the Delphi survey findings that suggested, midwives working in smaller OUs had lower thresholds for requesting that a woman's care be escalated off the labour ward, compared with those working in larger OUs. This appeared (in part) to be associated with aspects of local service delivery (reported in sections 4.6 & 8.2.4).

The Focus Groups study aimed to explore if / how local service delivery, in conjunction with other features of MHDC identified during the Delphi survey (e.g. woman's condition, vigilance and interventions required), influences midwives to either provide MHDC or escalate a woman's care away from the OU. Focus groups (n=6) were held across OUs of varying sizes / with varying facilities to assess the impact service delivery has. To 'trigger' the focus group discussions, three simulated clinical video vignettes were designed and shown to the participants in conjunction with written objective data. The three video vignettes were based on:

- 1) findings from the literature
- 2) the first phase Delphi findings and
- 3) an audit of clinical notes of women whose conditions had triggered clinical incident reporting.

Focus groups were chosen as the data collection method because they stimulate a range of participant views and opinions and can provide insight into complicated topics (Greenbaum, 1998; Krueger & Casey, 2009). The data were analysed using the framework method with a combination of a priori and inductive coding (Gale *et al.*, 2013; Smith & Firth, 2011).

1.6 Significance of the study

The number of women with pregnancies classed as being high risk or complex is increasing (Knight *et al.*, 2014; Lewis, 2007; Robson & Waugh, 2013) and it is reported that up to 5% of all pregnant or postnatal women will require MHDC (Saravanakumar *et al.*, 2008). Research exploring the factors that collectively comprise MHDC is required due to the lack of existing published research examining how professionals involved in the provision of MHDC define this type of care and interpret its component parts. Determining the factors that constitute MHDC will form an essential starting point from which practitioners may prospectively identify gaps or ambiguities that could have a negative impact upon MHDC provision (Cook, Render & Woods, 2000). Where gaps or ambiguities infiltrate care provision, professional miscommunications / misunderstandings may occur and the risk of adverse clinical incidents occurring is increased (Leonard, Graham & Bonacum, 2004; Reason, 2000). These may lead to maternal morbidity, which is not only be costly for the individual on a personal level, but may also be costly for the service provider in terms of individuals requiring additional medical treatments and hospital care (National Patient Safety Agency, 2007).

Midwives are usually the first professional groups to detect clinical deterioration in a woman's condition and be involved in her ongoing care if she remains in the OU. They will also be involved in the discussions about whether a woman's' care can continue safely on the labour ward (and she receives MHDC) or needs to be escalated to a

higher level. A detailed study of the factors that influence a midwife's decision to provide MHDC or request EoC, including the transfer to ICU or other specialist area, has not been undertaken, and the results of the research in this area will provide insight into a fundamental aspect of clinical practice that is crucial in promoting safe clinical outcomes for women and their babies. In order to reduce the number of women experiencing SMM, maternal clinical deterioration should be promptly identified and women's care escalated appropriately so the correct treatments and interventions are initiated in a timely fashion (Healthcare Commission, 2006; Lewis, 2004; Lewis, 2007; National Institute for Health and Clinical Excellence, 2007).

1.7 Organisation of the thesis

Chapter 2 will examine the published research and literature pertaining to MHDC and the EoC. Chapter 3 discusses the philosophical underpinnings of the research undertaken and the research design and methods used for both study phases. Due to the large quantities of data produced during the Delphi survey, chapters 4, 5 and 6 will report the findings of the first, second and third Delphi rounds successively. Chapter 7 presents the findings of the second study phase examining the factors influencing midwives to provide MHDC or escalate care away from the OU, whilst chapters 8 and 9 will discuss the findings of the two study phases in the context of the wider literature. Chapter 10 summarises the research findings, presents a synthesis of the first and second phase findings and makes recommendations for clinical practice and future research. The thesis organisation is summarised in Table 1-2.

Chapter number	Summary of chapter content
1	Introductory chapter
2	Literature review: Search strategies for MHDC and escalation of care searches. Presentation of two narrative reviews
3	Reporting of research design and methods for study phases one and two. Phase one: 3 round Delphi survey undertaken with obstetricians, anaesthetists and midwives to determine a consensus on the definition / defining features of MHDC across seven OUs remote from a tertiary referral centre. Phase two: Design and use of three video vignettes to trigger focus group discussions with midwives working in three OUs of differing annual birth rates to examine the factors that influence midwives to provide MHDC or escalate of a woman's care away from the OU.
4	Findings of Delphi survey first round presented
5	Findings of Delphi survey second round presented
6	Findings of Delphi third and final survey round presented
7	Findings of the second study phase examining midwives' escalation of care decisions at a local level presented
8	Discussion of the Delphi survey findings (all three rounds)
9	Discussion of the phase two (escalation of care) findings, integrated with the first study phase findings where applicable
10	Conclusions, contribution to knowledge and recommendations

Table 1-2 Summary of the organisation of the thesis

Chapter 2 Literature review

2.0 Introduction

This chapter presents two narrative reviews of the literature designed to examine the following questions;

- i) What is the definition of MHDC and what are the defining features of the concept?
- ii) What factors influence the escalation of care decisions made by healthcare professionals (including midwives)?

Firstly, the chapter outlines the search strategies used to select the relevant literature (section 2.1) and discusses why narrative as opposed to systematic reviews were undertaken. Section 2.2 – 2.7 examines the literature pertaining to MHDC whilst section 2.8 examines the literature regarding the EoC.

2.1 Literature search strategies

In order to obtain a contextual overview of the topics under consideration, two narrative literature reviews were undertaken (Bettany-Saltikov, 2012; Polit & Hungler, 1995). The first focused on the concept of MHDC, whilst a second review focused on care escalation. The first literature review sought to provide a comprehensive overview of MHDC including a definition of the concept and identification of its defining features including clinical indications for MHDC and the facilities / equipment and midwifery education and training required to provide this type of care.

The second literature review centred on the factors that influence healthcare professionals to escalate care. This review was undertaken in response to findings of the first research phase (Delphi survey) that suggested midwives working in smaller OUs had lower thresholds for escalating a woman's care away from the OU (as

opposed to providing MHDC), compared with those working in larger OUs. This appeared (in part) to be associated with aspects of local service delivery (see sections 4.6 & 8.2.4). These findings and the EoC literature review informed the second study phase (focus groups with midwives) which aimed to clarify if / how service delivery, in conjunction with other features of MHDC identified in the Delphi survey, influenced midwives' decisions to provide MHDC or escalate care away from the labour ward when working in a range of OUs.

Cronin, Ryan and Coughlan (2008) have identified four groups of literature sources. Primary sources refer to original research, secondary sources encompass review articles, a third group of papers examine concepts or theories and a fourth group includes "anecdotal, opinion or clinical" papers (Cronin, Ryan & Coughlan, 2008, p.41). Preliminary literature searches investigating the concept of MHDC revealed there were limited numbers of primary sources. Many of these sources comprised low quality evidence when critically appraised using the Joanna Briggs Institute evidence guide and fell at or towards, the bottom of the hierarchy of evidence (Joanna Briggs Institute, 2016). Moreover more secondary sources / opinion papers were evident (Bettany-Saltikov, 2012), especially with regards to MHDC. As a consequence, two narrative reviews were undertaken to access all four groups of literature sources, especially in relation to MHDC (Cronin, Ryan & Coughlan, 2008; Pope, Mays & Popay, 2007). The inclusion of lower level evidence, local audits, conference abstracts and books gave some useful insights regarding MHDC that would otherwise have been lost. Inclusion criteria for the narrative reviews of MHDC and EoC included:

- Primary and secondary research
- Opinion papers / editorials
- Local audits / clinical reviews
- Conference abstracts / books

The 'PICO' tool (Figures 2-1 & 2-2) guided both literature search strategies (Booth, 2006).

Population	Pregnant or postnatal women
Intervention (or exposure)	Maternity High Dependency Care
Control (or comparison)	Not applicable
Outcome	i) Definition / Incidence ii) Defining features of the intervention

Figure 2-1 PICO question for the MHDC review

Population	Midwives / healthcare professionals working in acute hospital settings
Intervention (or exposure)	Escalation of care
Control (or comparison)	Not applicable
Outcome	Identification of the factors that influence healthcare professionals' decisions to escalate care

Figure 2-2 PICO question for the EoC review

The electronic databases of CINAHL, Cochrane Library, the Joanna Briggs Institute EBP Database, EMBASE, Medline (OVID), Web of Science and ZETOC were utilised. Varying permutations of the search terms identified in Tables 2-1 and 2-2 were used. For the MHDC review the search terms 'critical' and 'intensive' were included in the list as an initial search, using the terms 'high dependency' and 'intermediate' care revealed a limited number of results. This was undertaken to prevent 'over convergence' early on in the searching process and reducing the risk of an inadequate review of the literature. (Ang, 2014).

Maternity High Dependency Care search terms									
Boolean Operator	Search Term Column 1	Boolean Operator	Search Term Column 2	Boolean Operator	Search Term Column 3	Boolean Operator	Search Term Column 4	Boolean Operator	Search term Column 4
Column search terms interspersed with OR	Obstetric*	AND	High Dependency	AND	Care	AND	Definition	NOT	Neonat*
	Matern*		High* Depend*		Unit		Characteristics		Gynecolog*
	Midwi*		Intermediate				Features		End of Life
	Perinatal		Critical				Indications		Infertility
			Intensive				Education		
			Progressive				Training		

Table 2-1 The search terms used for the MHDC electronic database search

For the EoC search, the terms included escalation, care, deterioration, health professionals, decision making / process and 'high dependency care' (Table 2-2).

Escalation of Care search terms									
Boolean Operator	Search Term Column 1	Boolean Operator	Search Term Column 2	Boolean Operator	Search Term Column 3	Boolean Operator	Search Term Column 4	Boolean Operator	Search term Column 4
Column search terms interspersed with OR	Escalat*	AND	Care	AND	Health professional	AND	"Decision making"	NOT	Neonat*
			Deterioration		Nurses		Process		End of Life
					Midwives		"high dependency care"		
					Doctors		Factors		

Table 2-2 The search terms used for the EoC electronic database search

Synonyms and abbreviations were included and combined with the use of truncation ciphers (e.g. * \$) where applicable, in order to perform a comprehensive but specific review (Aveyard, 2014; Bettany-Saltikov, 2012). Subject headings and Medical subject headings (MESH terms) were used where appropriate, to search for keywords listed by databases (National Library of Medicine, 2013). Boolean operators (AND / OR / NOT) were used to combine the search terms and reduce the number of irrelevant papers and promote convergence searching (Aveyard, 2014). The following limiters were used to reduce the number of irrelevant papers retrieved for the MHDC search:

- English language papers only
- Papers published between the dates of January 1997 to September 2016.
- Gender: female
- Human / Adult / Age > 19 years ≤ 44 years

The year of 1997 was chosen as the first date limiter as Cordingley & Rubin published their widely cited paper on service provision across UK OUs and included MHDC in this survey (Cordingley & Rubin, 1997).

The process of 'snowball' searching was also employed, to identify papers, books and guidelines cited in key articles that were not identified by the original electronic database searches (Ang, 2014). Professional websites were also searched (e.g. Royal College of Obstetricians and Gynaecologists, Obstetric Anaesthetists' Association, Royal College of Midwives) for policy documents and guidance relevant to MHDC provision. Primary research papers were critically analysed using the appropriate Joanna Briggs Institute (JBI) critical appraisal checklists, whilst secondary sources were analysed using the JBI critical appraisal checklist for text and opinion papers (Joanna Briggs Institute, 2016).

The initial literature search for the MHDC review was undertaken in June 2007 when the Delphi survey was in the planning phase. The searches were updated trimonthly to identify newly published papers. This process was repeated until September 2016. The escalation of care literature review was undertaken in 2012 following the results of the Delphi survey. The following limiters were used:

- English language papers only
- Human subjects
- Papers published between the dates of January 2004 to September 2016.

The year 2004 was chosen as the first date limiter to ensure only contemporary sources were identified as this is an aspect of clinical practice that is gaining increasing amounts of research attention. The searches were updated trimonthly to identify newly published papers. This process was repeated up until September 2016. The only exception to this process occurred when the researcher suspended her studies between May 2015 and February 2016.

2.1.1 Process for selecting relevant evidence

The titles and abstracts of papers were reviewed to assess their relevance. Where abstracts were unavailable for journal articles or it was not clear whether a paper was suitable for inclusion, the full article was retrieved. The levels of evidence were graded using the Joanna Briggs Institute (JBI) levels of evidence. Level one evidence encompasses experimental designs, level two, quasi-experimental; level three, analytical observational studies; level four, descriptive observational studies and level five comprises expert opinion and bench research (Joanna Briggs Institute, 2016). Due to limited higher level evidence, levels four and five and low quality studies were included in the reviews. Figure 2-3 shows the number of papers identified during the MHDC search and Figure 2-4 shows the number of papers retrieved for the EoC search.

Tables A1-1, A1-2 and A1-3 (Appendix 1) report the primary research, audits and level five evidence in the MHDC literature review.

Table A1-4 (Appendix 1) reports the primary research papers included in the EoC literature review.

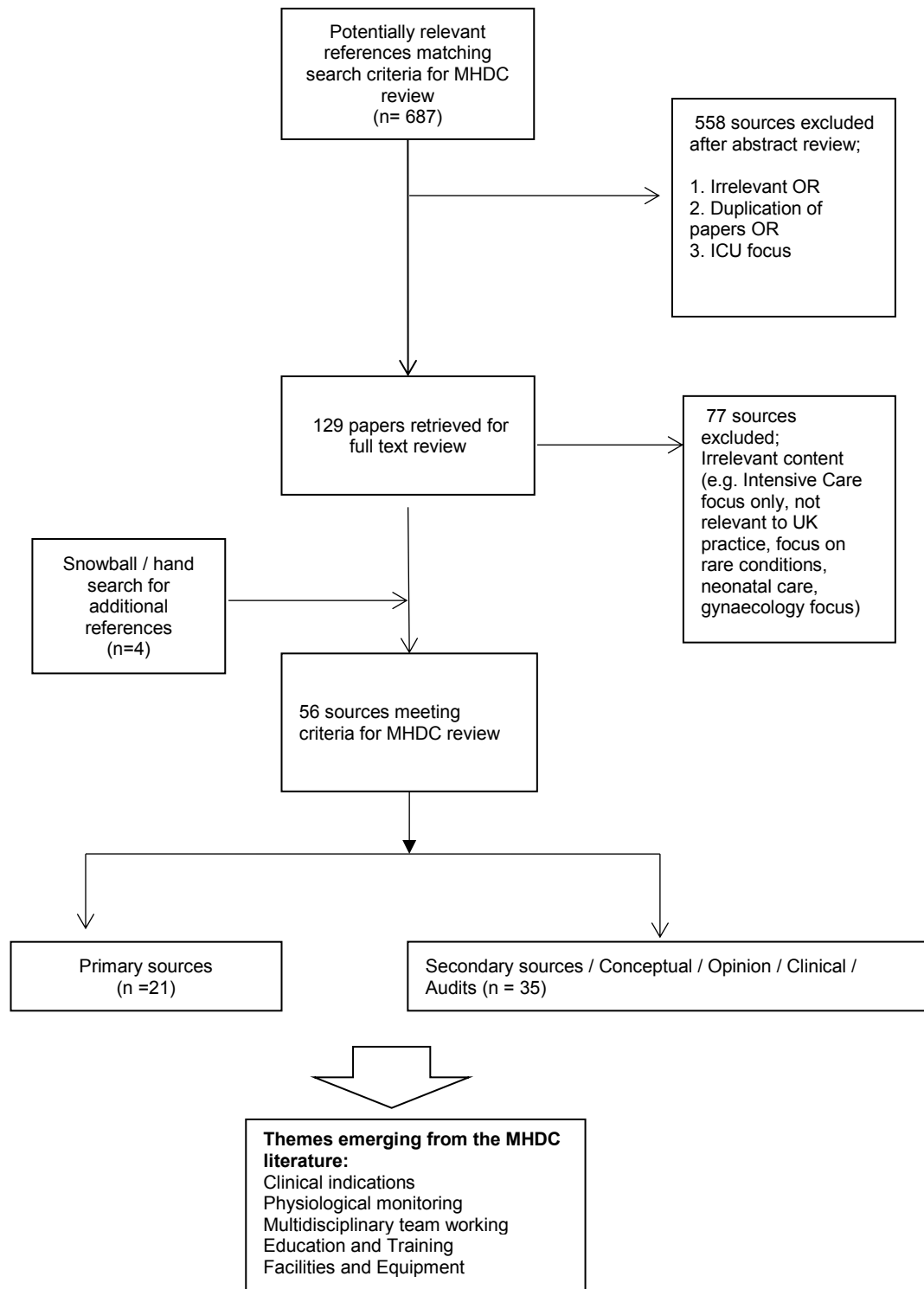


Figure 2-3 Process of selecting relevant papers for the MHDC review

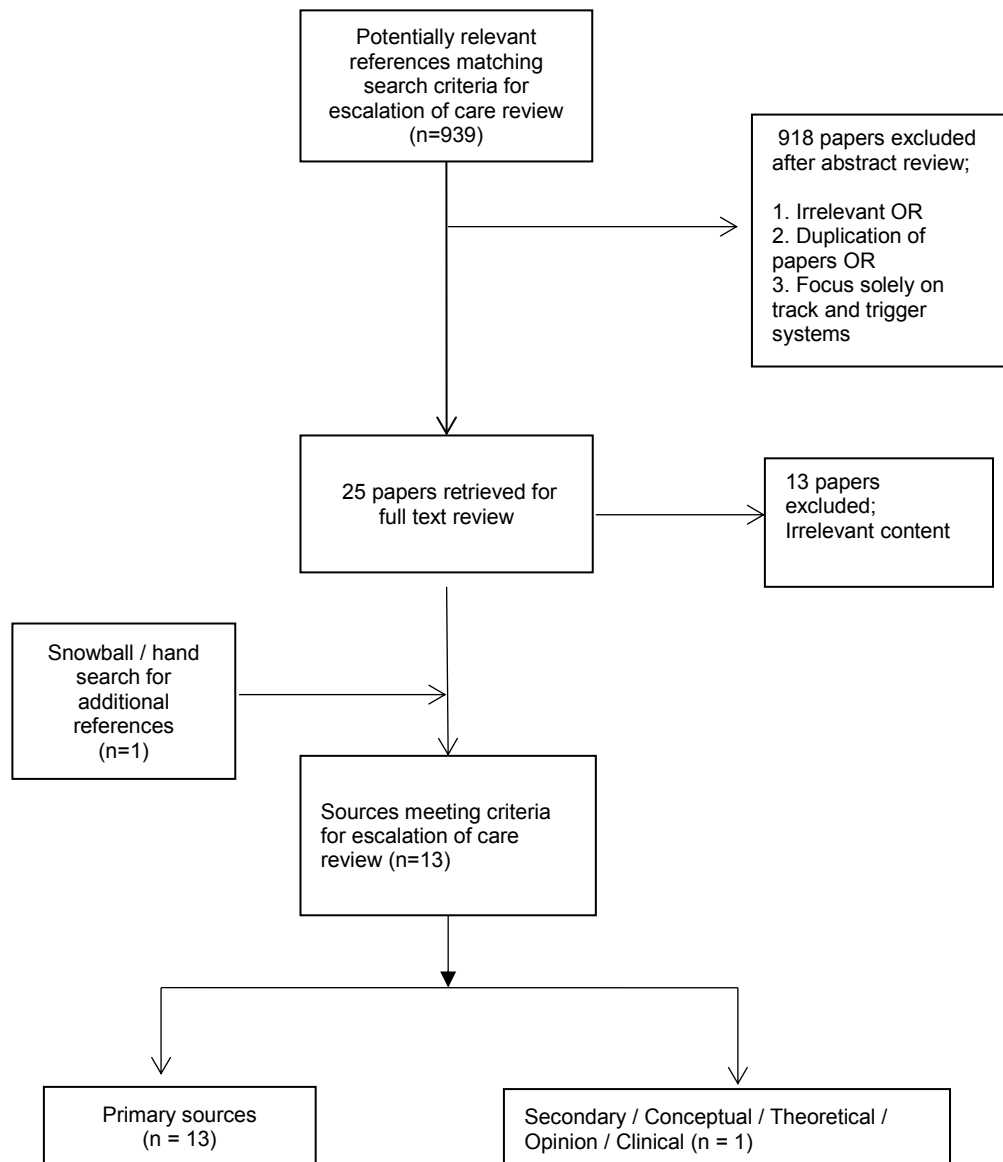


Figure 2-4 Process of selecting relevant papers for the EoC review

2.2 Defining Maternity High Dependency Care

The researchers undertaking a Scottish wide survey of consultant OUs in 2007 examining MHDC provision suggest the definition for MHDC is “vague” (du Plessis *et al.*, 2010, p S27). However, it is advocated that the widespread adoption of the ICS levels of care (ICS, 2002 & 2009) should replace the term high dependency care and support the standardised data collection vis-à-vis the numbers of women receiving care levels one, two and three in OUs (Kuukasjarvi & Waite, 2012; Scrutton & Gardner, 2012; Wheatly, 2010). Sections 2.2.1 – 2.2.3 summarises the ICS levels of care and describes how these may be applied within the OU setting.

2.2.1 Levels of care in the context of maternity care provision

‘Level 0’ care equates with care of ‘low risk women’, whilst ‘level 1’ care encompasses the care of women requiring additional monitoring / interventions, or step down care from a higher level as stated by expert opinion (Maternal Critical Care Working Group, 2011; Wheatly, 2010). Examples of women receiving level 1 care according to the Maternal Critical care working group guideline (2011, p 6) include women at risk of haemorrhage and those with oxytocin infusions in progress. Women with neuraxial analgesia, diabetics on insulin infusions and woman with medical disorders may also be classed as receiving level 1 care (Maternal Critical Care Working Group, 2011).

These examples show how the levels of care can be applied to the childbearing population. However, assessment of a woman’s ‘risk’ of haemorrhage is complex and may be difficult to quantify. Moreover, the clinical reason for the administration of an intravenous oxytocin infusion is unspecified and it is unclear as to whether a woman is requiring augmentation of labour or is receiving the infusion post birth as a prophylactic measure to prevent postpartum haemorrhage. ‘Women with medical disorders’ is a broad classification, and will be dependent on the severity of the medical disorder and

the impact it has on pregnancy and vice versa. Some examples are open to interpretation and equate with what may be classed as 'routine high-risk obstetric care'.

Prior to the publication of the Maternal Critical Care Working Group guideline (2011), alternative clinical examples for level 0 and level 1 care were suggested by James, Endacott and Stenhouse (2011) in a discussion paper (Table 2-3), with level 1 care examples including;

- Women requiring regular clinical input from the Obstetrician / Obstetric Anaesthetist / additional specialist(s).
- Acute obstetric admissions with non-reassuring MEOWS score.
- Women requiring IV drugs through a central venous catheter.

These examples were based on the premise that women receiving routine high risk labour ward care, who are otherwise healthy and clinically stable, equate with those requiring 'normal (labour) ward care' and might be reclassified as receiving level 0 (intrapartum) care. Correspondingly, healthy low risk women fall outside of this classification system as they do not necessarily require OU care.

Nursing		Midwifery	
Level 0 criteria (Intensive Care Society, 2009)	Examples of level 0 care (Intensive Care Society, 2009)	'Proposed' criteria for 'maternity' level 0 care	Proposed examples for 'maternity' level 0 care
Patients who require hospitalisation but whose needs may be met through normal ward care in an acute hospital	<ul style="list-style-type: none"> • Intravenous therapy • Observation required less frequently than four-hourly 	<p>Antenatal</p> <ul style="list-style-type: none"> • Pregnant women whose clinical needs can be met on the antenatal ward of an obstetric unit <p>Intrapartum</p> <ul style="list-style-type: none"> • Women whose intrapartum needs can be met through 'routine' care on the labour ward of an obstetric unit <p>Post partum</p> <ul style="list-style-type: none"> • Women whose clinical needs may be met on the postnatal ward of an obstetric unit 	<ul style="list-style-type: none"> • Obstetric, medical or fetal complications requiring non-invasive monitoring (e.g. temperature, pulse, blood pressure, respiratory rate, pulse oximetry) and urinary output monitoring less frequently than four-hourly • Antenatal acute obstetric admission^a with reassuring MEOWS scoring • Healthy woman in labour at term^b • Epidural analgesia for pain relief during labour^c • Pre-term labour in otherwise healthy woman • Healthy woman in labour^b with fetal complications. • The presence of obstetric or medical conditions requiring non-invasive monitoring (e.g. temperature, pulse, blood pressure, respiratory rate, pulse oximetry) and urinary output monitoring less frequently than four-hourly during the postnatal period • Postnatal re-admission with reassuring MEOWS scoring
Level 1 criteria (Intensive Care Society, 2009)	Examples of level 1 care (Intensive Care Society, 2009)	'Proposed' criteria for 'maternity' level 1 care	Proposed examples for 'maternity' level 1 care
Patients recently discharged from a higher level of care	<ul style="list-style-type: none"> • Patients requiring a minimum of four-hourly observations 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • Women transferred from the intensive care unit to the labour ward for continued monitoring and treatment
Patients requiring critical care outreach service support	<ul style="list-style-type: none"> • Abnormal vital signs but not requiring a higher level of critical care 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • As per Intensive Care Society (2009) • Women at risk of clinical deterioration and the possible need for level 2 care
Patients in need of additional monitoring/clinical interventions, clinical input or advice	<ul style="list-style-type: none"> • Epidural analgesia or patient-controlled analgesia in use • Requiring a minimum of four-hourly observation on the basis of clinical need • Patient requiring bolus IV drugs through a central venous catheter • Patients requiring continuous oxygen therapy • Patients receiving parenteral nutrition 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • Women requiring epidural analgesia or patient-controlled analgesia on the postnatal ward • Presence of pre-existing medical and/or obstetric complications requiring: <ul style="list-style-type: none"> Non-invasive haemodynamic monitoring less than four-hourly Acute obstetric admission^a with non-reassuring MEOWS score • Women requiring bolus IV drugs through a central venous catheter • Administration of boluses of IV fluids/blood products/IV medications and/or requiring continuous oxygen therapy • Requiring regular clinical input from the obstetrician/obstetric anaesthetist/additional specialist(s)

a. Lewis, G., 2007. The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer - 2003-2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. CEMACH, London.

b. National Institute for Health and Clinical Excellence, 2007. Clinical Guideline 55, Intrapartum Care. Care of healthy women and their babies. NICE, London.

c. Healthcare Commission, 2008. Towards better births. A review of maternity services in England. Healthcare Commission, London.

Table 2-3 Proposed examples for maternity level 0 and level 1 care (James, Endacott & Stenhouse, 2011) [Permission to reproduce this table has been granted by 'Midwifery' / Elsevier].

2.2.2 Level two and level three care

The Maternal Critical Care Working Group (2011, p 6) provides examples of levels 2 and 3 care in the context of the obstetric population, and these include:

Level 2 care

- Extended post operative care (although this is not defined).
- Step down care from level three to level two.
- Respiratory support (50% or more oxygen via a face mask to maintain oxygen saturations or Continuous Positive Airway Pressure or Bi-Level Positive Airway Pressure).
- Basic cardiovascular support (e.g. intravenous antihypertensives for blood pressure control in pre-eclampsia, CVP line for fluid administration and monitoring to guide therapy).
- Neurological support (e.g. administration of magnesium sulphate to control seizures and intracranial pressure monitoring).
- Hepatic support (e.g. management of acute fulminant hepatic failure caused by HELLP syndrome or acute fatty liver).

Level 3 care

- Invasive mechanical ventilation (intubation and ventilation)
- Support of two or more organ systems e.g. Renal support and BRS.
- BRS/BCVS and an additional organ supported (Maternal Critical Care Working Group, 2011, p.6).

Data collected over a two-year period (1st January 2007 until 31st December 2008) from the ICNARC Case Mix Programme (CMP) database identified the levels of care obstetric patients received on adult general critical care units (Intensive Care National

Audit & Research Centre, 2011). “The analyses were based on data from 13,950 admissions to 158 general critical care units based in NHS hospitals across England, Wales and Northern Ireland” (ICNARC, 2011, p3). The data comprised women classed as currently or recently pregnant, and in 2007, there were 95 pregnant and 412 recently pregnant women admitted, whilst in 2008, there were 202 pregnant and 957 recently pregnant admissions. The combined data for both years are summarised in Figure 2-5.

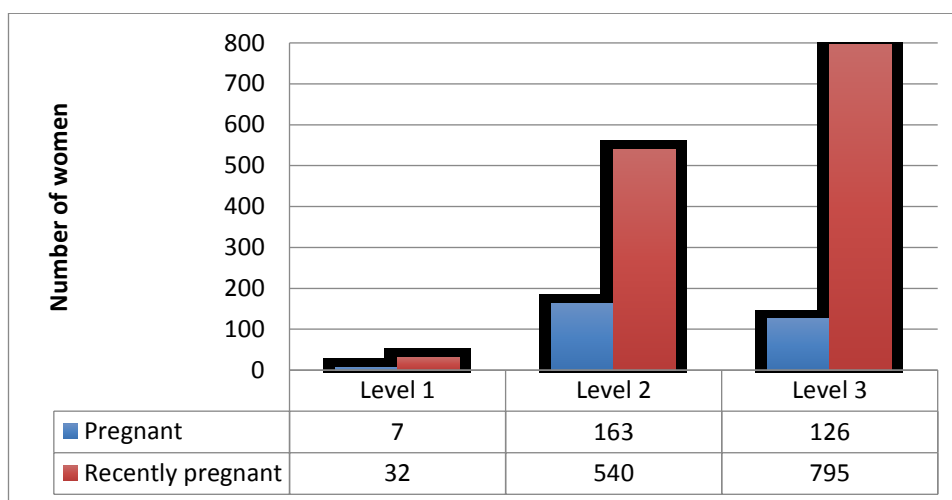


Figure 2-5 Level of care classification for pregnant and recently pregnant women admitted to critical care units between 1st January 2007 and 31st December 2008 (data source; ICNARC, 2011)

Whilst many admissions to intensive care (in both the pregnant and recently pregnant cohorts) received level 3 care, significant numbers of women received level 2 care. The large increase in the number of admissions to critical care between the two years is unexplained. Thirty-nine women required level 1 care and it is suggested that a proportion of the women receiving level 1 and 2 care may have been suitable candidates for MHDC.

2.2.3 The definition of MHDC

Studies and audits examining MHDC prior to and following the inception of the levels of critical care for adult patients (ICS, 2002; 2009) do not consistently offer definitions for the concept of MHDC. Table 2-4 provides examples of studies examining facets of MHDC provision and where definitions were or were not provided. The majority of these studies comprise research at the lower end of the hierarchy of evidence (Joanna Briggs Institute, 2016), with one audit paper (Kuukasjarvi and Waite, 2012).

Author(s) (date)	Type of study	JBI Level of Evidence	Definition for MHDC included in the paper?
Cordingley & Rubin (1997)	Postal survey examining facilities for MHDC	4	No.
Ryan et al. (2000)	Retrospective case note review examining admission diagnoses	4	No.
Gaunt et al. (2002)	Prospective study Data collected using the National Obstetric Anaesthesia Database.	4	Yes. Department of Health (1996) high dependency care guideline used to define MHDC.
Zeeman <i>et al.</i> (2003)	Prospective study examining admissions to an Obstetric Intermediate Unit (USA)	4	Yes: "more care than can be provided on a general ward" but strict admission criteria are stated (page 532-533)
Du Plessis et al. (2010)	Scottish wide survey of consultant OUs in 2007 examining high dependency care provision	4	Yes. Acknowledges the concept is "vague" and defines as "increased patient observation with or without intervention and single organ support" (p. S27). Also, includes postoperative and step down care in the definition.
Hussain et al. (2011)	2005-2006 Survey of OUs (n=228)	4	No
Kuukasjarvi and Waite (2012)	Retrospective audit of case notes over a one-week period in September 2010. All women (n=66) admitted to the labour ward had their care 'mapped' against the ICS levels of care (in a Lancashire teaching hospital)	<i>Audit</i>	Yes. ICS levels of care
Dattaray et al. (2013)	4-year retrospective observational study (India)	4	No

Table 2-4 Examples of studies examining MHDC that include / do not include a definition for the concept

There is a dearth of robust evidence suggesting that women receiving MHDC are classified according to the ICS levels of care. The lowest level of evidence available (Joanna Briggs Institute, 2016) suggests women receiving MHDC may be classed as

receiving either level 1 or level 2 care or, solely level 2 care (Price, Slack & Nelson-Piercy, 2008; Scrutton & Gardner, 2012; Vaughan *et al.*, 2010). In contrast, level 1 care has been equated with high dependency care by the Maternal Critical care Working Group document and levels 2 and 3 likened to 'maternal critical care' (Maternal Critical Care Working Group, 2011).

Kuukasjarvi and Waite (2012) conducted a retrospective audit of case notes in a Lancashire teaching hospital over a one-week period in September 2010 to categorise the level of care each woman received. Sixty-six women admitted to the labour ward had their care 'mapped' against the ICS levels of care, although it is unclear as to the status of the healthcare professional who did this mapping and how these data were verified. Twenty-six per cent of women required level 0 care, 71% (n=47) required level 1 care and 3% (n=2) required level 2 care. Both women requiring level 2 care experienced major postpartum haemorrhage following emergency LSCS and were classed as receiving MHDC.

A recent Mothers and Babies Reducing risk through Audits and Confidential Enquiries across the UK (MBRACE-UK) report, examining the markers for severe sepsis morbidity included those women needing level 2 or 3 critical care, but also included women requiring "obstetric HDU type care (Knight *et al.*, 2014, p.7), suggesting ambiguous terminology is used to describe MHDC.

Given the inconsistencies regarding the definition of MHDC, further clarification and an agreed definition is required, based on robust evidence. However, the groups of women requiring MHDC in terms of their admission diagnoses and the types of monitoring and treatments they may receive are frequently cited in books, opinion papers and retrospective observational studies examining the concept (Billington &

Stevenson, 2007; du Plessis et al., 2010; Ryan *et al.*, 2000; Saravanakumar *et al.*, 2008; Van de Velde, Scholefield & Plante, 2013).

2.3 Clinical indications for MHDC

The clinical differences between women requiring MHDC and those who have clinical indications for intensive care has been researched by Pollock, Harley & Nelson (2011). The researchers conducted a prospective cross-sectional study in Australia comparing the severity of illness scores (APACHE II) and dependency scores (TISS 28) of 137 women requiring intensive, general high dependency and MHDC across seven tertiary level hospitals (Pollock, Harley & Nelson, 2011). Both scoring systems are widely recognised and validated. However lead time bias, the length of time that lapses before admission to ICU can influence severity of illness scores (Hall, Schmidt & Wood, 2005) and is a potential confounding factor, that was beyond the control of the researchers. Furthermore, the study was conducted between 2002-2004, over a decade ago, when obstetric care was less advanced.

The women requiring intensive care were found to be more sick with significantly higher APACHE II and TISS 28 scores compared with the other two groups of women. The median APACHE II score was 11 for the ICU group compared with 7.0 for the MHDC group whilst the median TISS 28 score was 33 for the ICU group and 17.0 for the MHDC group. In terms of the generalisability of the findings the researchers acknowledge that replicating study with a larger sample size “would be worthwhile” (Pollock, Harley & Nelson, 2011, p226). In comparison to these findings, the mean APACHE II score for women classed as recently pregnant across 232 UK ICUs in the Case Mix Programme was 10.1 (SD 5.0) (Intensive Care National Audit & Research Centre, 2013).

A review of research and audits examining MHDC services at local hospital level provides insight into the clinical reasons why women require MHDC (Table 2-5, pages 60-61) although the majority of these studies comprise low level evidence (Joanna Briggs Institute, 2016) and do not provide information regarding women's severity of illness scores.

Author / date	Brief overview of study methods / background	Results / indications for MHDC	Research critique
Ryan et al. (2000)	Retrospective survey of case notes of all admissions to the new obstetric HDU of a tertiary referral centre in Dublin over a two-year period (1996-1998). Also, a two-year review of obstetric admissions to ICU pre-establishment of the Obstetric HDU to compare referral patterns pre and post the Obstetric HDU.	12,070 births in total over the 2-year study period following the establishment of the HDU. 1.02% (n=123) of all women were admitted to the Obstetric HDU. <u>Obstetric indications</u> for MHDC (n=100, 81.3% women): Preeclampsia (44.7%) Postpartum haemorrhage (21.1%) Antepartum haemorrhage (7.3%) HELLP (6.5%) Uterine perforation (0.8%) Uterine rupture (0.8%) <u>Non-obstetric indications</u> (n=23, 18.7%) e.g. Epilepsy 3.7%, pulmonary embolism 2.4%. ischaemic heart disease 1.7%	<i>Level 4 evidence</i> A large sample size surveyed but the data excludes five patients admitted to the HDU from ICU for step down care. Data collected almost 2 decades ago indicating the findings are unlikely to be generalizable to contemporary practice.
Zeeman et al. (2003)	Prospective study evaluating admissions to a five-bedded obstetric intermediate care unit over a two-year period (1998 and 1999) and obstetric admissions to the medical / surgical intensive care unit. Study conducted in Dallas USA in a maternity unit conducting 14,000 births per year.	483 women required intermediate care (1.07% of 28,376 women) <u>Obstetric diagnoses</u> accounted for 66% of admissions (n=318) (20% antenatal admissions, 80% post-natal admissions) Eclampsia / severe pre eclampsia 207, haemorrhage 85, puerperal sepsis 14, other 12. <u>Non-obstetric diagnoses</u> accounted for 34% of admissions (n=165). Medical disorders 134, e.g. antepartum pyelonephritis, diabetes mellitus 32, respiratory insufficiency 34 (asthma 7, pneumonia 10), cardiac 23, chronic hypertension 11, thyrotoxicosis 4, other 30, surgical disorders 31.	Level 4 evidence American maternity unit, sample may not generalizable to the UK population as the characteristics of the local case mix are not known.

Table 2-5 Studies citing evidence into the clinical indications for MHDC.

Author / date	Brief overview of study methods / background	Results / indications for MHDC	Research critique
Rajagopal et al. (2011)	Retrospective survey of MHDC admissions in 6000 births per annum obstetric unit over an 8-month period in 2010 (Glasgow).	HDU admissions accounted for 1.8% of births Indications for MHDC were: Severe preeclampsia (22%) Major haemorrhage (blood loss unspecified) 44% Medical disorders (34%) (Mainly cardiac disease) 12% were antenatal admissions and 88% post-natal admissions	Level 4 evidence Only 50 out of a total of 74 case notes were available for review making the validity of the findings questionable
Dattaray et al. (2013)	Retrospective observational cohort study of over a four year period (2007-2011). Conducted in Eastern India in a large tertiary referral unit. High risk population with inadequate care infrastructures and limited / no access to antenatal care.	HDU admission rate of 11.2 per 1000 births. 57 women in total. 68.4% admitted for obstetric reasons: Septicaemia 35.1% Postpartum haemorrhage 29.1% Hypertension 21.1% 31.6% admitted for medical disorders Single organ support cited as main indication for MHDC.	Level 4 evidence Eastern Indian data - cannot be generalized to UK population as service provision and case mix not comparable. 48 of the 57 women had no antenatal care and were from a very high risk local population.
Kavanagh & Brown (2015)	Retrospective observational study conducted in the Irish Republic in a standalone OU with 9000 births / annum over three-year period (2011-2014)	376 MHDC admissions Hypertensive disorders accounted for 50% of all admissions. Obstetric haemorrhage 36% Comorbidities 11%	<i>Abstract</i> – unable to determine how the data were collected and the ability to critically analyse the methods used are not possible.
Raglan <i>et al.</i> (2015)	Four months of data collected across two London hospital sites.	43 women required MHDC. Postpartum haemorrhage most common reason for MHDC but percentage of women not disclosed. Need for invasive monitoring was second most prevalent indication for admission.	<i>Abstract - Prospective audit.</i> Insufficient detail to comment on the data collection and analyses processes employed.

Table 2-5 Studies citing evidence into the clinical indications for MHDC (continued)

Ryan *et al.* (2000) conducted a retrospective survey of case notes of all admissions to the new obstetric HDU of a tertiary referral centre in Dublin over a two-year period commencing in 1996. There were a total of 12,070 births over the 2-year study period and 1% of all women (n=123) were admitted to the Obstetric HDU (Ryan *et al.*, 2000). Of these women, 81% were admitted for obstetric reasons compared with 19% for non-obstetric reasons. Pre eclampsia and HELLP syndrome accounted for 51% of the total obstetric admissions and obstetric haemorrhage accounted for 28% (Ryan *et al.*, 2000). However, this observational descriptive study involves a single site tertiary referral centre and is over 17 years old (Joanna Briggs Institute, 2016) indicating the findings may not be generalisable.

A prospective study conducted in an American county hospital classed as level four evidence, identified that obstetric conditions accounted for 66% of the admissions to an obstetric intermediate care unit (n=318) (Zeeman, Wendel & Cunningham, 2003). Pre eclampsia / eclampsia were the most common obstetric reasons for admission (n= 207, 66%) and obstetric haemorrhage accounted for an additional 27% of the admissions. Non obstetric diagnoses (primarily comorbidities) accounted for 34% of the women admitted (Zeeman, Wendel & Cunningham, 2003). Contrastingly, an audit of women admitted to MHDC over a four year period between 2003 and 2007 in one English tertiary referral centre determined that obstetric haemorrhage and hypertensive disorders of pregnancy accounted for similar numbers of admissions (36% (n=485) and 35% (n=478) respectively) (Saravanakumar *et al.*, 2008). Obstetric admissions were more prevalent than non-obstetric admissions in this study (75% versus 25%) and the main comorbidities necessitating MHDC were cardiac and respiratory disorders (Saravanakumar *et al.*, 2008).

Rajagopal *et al.*'s., (2011) eight-month retrospective observational study conducted in Scotland also found that the most common obstetric reasons for admission to the MHDC of an OU with an annual birth rate of 6000 per annum were major obstetric haemorrhage (44%, n=22) and severe pre eclampsia (22%, n=11). In this study comorbidities accounted for 34% (n=17) of all MHDC admissions. However, only 50 out of a total of 74 sets of case notes were examined (Rajagopal *et al.*, 2011) indicating the internal validity of this study may be compromised. An Indian study, also classed as level four evidence, identified that more women were admitted to MHDC for obstetric conditions than medical disorders, however a significant proportion of women had primary diagnoses of septicaemia (35.1%) (Dattaray *et al.*, 2013). This finding cannot be generalized to the UK population as service provision and case mix are not comparable; 48 of the 57 women admitted for MHDC had received no antenatal care and were from a high risk local population (Dattaray *et al.*, 2013).

A contemporary UK retrospective survey of MHDC provision in a tertiary referral unit conducted over a two year period, using data from electronic records found that 50% of women were admitted for obstetric haemorrhage, 16% for hypertensive disorders and 10% for cardiac disorders (Whitworth *et al.*, 2016). The researchers acknowledge the findings may not be generalisable to OUs that do not provide tertiary level care, because there is likely to be a higher prevalence of MHDC in these centres (Whitworth *et al.*, 2016). However, there is limited robust evidence to support this pragmatic claim.

Overall, there are indications that more women receive MHDC for obstetric reasons than comorbidities alone (Price, Slack & Nelson-Piercy, 2008; Saravanakumar *et al.*, 2008; Whitworth *et al.*, 2016; Zeeman, Wendel & Cunningham, 2003). However, the aforementioned studies comprise low level evidence that have the highest chance of bias (Joanna Briggs Institute, 2016; National Institute for Health and Care Excellence,

2014a; Whitworth *et al.*, 2016). Moreover, the retrospective nature of some of the studies is likely to have an impact on the quality of the data that is collected and analysed (Matthews & Ross, 2010; Pollock, Rose & Dennis, 2010).

The Intensive Care National Audit & Research Centre (ICNARC) provides a detailed analyses of admission diagnoses for pregnant or recently pregnant women admitted to all critical care units in England, Wales and Northern Ireland (ICNARC, 2013). For the period 2009- 2012, 1188 women were classed as currently pregnant and of these 103 (8.7%) were admitted for obstetric related admissions whilst the remainder (91.3% n=1085) were admitted for non-obstetric reasons (ICNARC, 2013). The main obstetric reasons for admission in this cohort were hypertensive disorders (pre eclampsia, HELLP and eclampsia) accounting for 37.9% (n=39) women and haemorrhage (threatened miscarriage, antepartum and peripartum bleeding, uterine rupture) which, accounted for 20.4% (n=21) (ICNARC, 2013). Hypertensive disorders were classified under the umbrella term of the genitourinary system and this body system accounted for 75.7% (n=78) of the total admissions to intensive care in this cohort (ICNARC, 2013).

A significant proportion (42.1%, n=457) of the currently pregnant non-obstetric related admissions to intensive care were for respiratory system related conditions including pneumonia (n=270), asthma (n= 94) and adult respiratory distress syndrome (ARDS) (ICNARC, 2013). Women diagnosed with cardiovascular complications and comorbidities accounted for 8.8 % (n=95) of the admissions (ICNARC, 2013).

In comparison to the numbers of women classed as currently pregnant (n=1188), there were 3909 recently pregnant women admitted to ICU for obstetric reasons and 1696 women admitted to ICU for non-obstetric reasons (ICNARC, 2013). The smaller

numbers of currently pregnant women admitted to ICU may be attributable to women receiving care on labour wards where there is access to specialist obstetric, anaesthetic and midwifery care before being transferred to ICU post birth.

Of the 3909 recently pregnant women admitted to ICU for obstetric related reasons, complications of the genitourinary system accounted for 93.2% (n=3644) of these. Postpartum haemorrhage was the primary reason for admission for 2014 of these women, whilst hypertensive disorders including eclampsia and HELLP was the primary admission criteria for 451 women. Amniotic fluid embolus accounted for only 24 women being admitted to ICU and DIC for 8 women. Non-obstetric reasons for recently pregnant women to be admitted to intensive care included complications and conditions related to the respiratory (28.6%, n=486), cardiovascular (18.3%, n=311), gastrointestinal (14.7%, n=250), genitourinary (14.6% n=247), neurological (11.6%, n=197), endocrine (5.4%, n=91) and haematological systems (2.6%, n=45) (ICNARC, 2013).

The more commonly encountered obstetric disorders and complications identified through the ICNARC data are replicated by those women requiring MHDC, although robust national data collection systems are required in order to investigate the reasons for MHDC. However, the differing definitions for MHDC add to the complexities of introducing such systems.

2.4 The defining features of MHDC

2.4.1 Staff to patient ratios

High dependency care is characterised by higher levels of staff to patient ratios (typically either one staff member to 1, 1.5 or 2 patient(s) ratio), than the allocation on general hospital wards, according to expert opinion and research (Association of Anaesthetists of Great Britain & Ireland and the Obstetric Anaesthetists' Association, 2013; Department of Health, 2000; Garfield, Jeffrey & Ridley, 2000). Definitive midwife to woman ratios for women requiring MHDC have not been researched to date.

2.4.2 Treatments associated with MHDC

Expert opinion suggests the treatments women receive as part of MHDC are reflective of the treatments required by the general high dependency care patient population, in combination with those specific to obstetrics (Maternal Critical Care Working Group, 2011). Examples of the treatments used in the management of women with pregnancy specific conditions and comorbidities are outlined in Appendix 2 (Tables A2-1&2). These treatments reflect those cited by the wider obstetric literature and are not specific to MHDC. The Maternal Critical Care working Group (2011) provide some examples of the treatments that women requiring level 1 and level 2 care require as stated in sections 2.2.1 and 2.2.2.

2.4.3 Patient monitoring

Section 2.4.3.1 provides background information regarding patient monitoring for those requiring high dependency care, and utilises supplementary literature, independent of the MHDC focused review.

2.4.3.1 Patient monitoring; background information

Patient monitoring includes both non-invasive and invasive modalities (Moore & Woodrow, 2009). Non-invasive monitoring includes recording of the pulse, blood pressure, respiratory rate, temperature and pulse oximetry (vital signs), continuous electrocardiograph (ECG) monitoring, assessment of the level of patient consciousness (neurological assessment) and urinary output (Elliott & Coventry, 2012). The frequency with which vital signs are recorded has been identified as an under researched area of clinical practice, but will be influenced on an individual basis by a woman's diagnosis and her level of acuity (Booker, 2015; National Institute for Health and Clinical Excellence, 2007). Current guidance suggests vital signs should be recorded at a minimum of 1 or 4 hourly intervals, depending on the level of care required by the patient (Intensive Care Society, 2009).

Invasive haemodynamic monitoring includes the use of arterial lines, central venous pressure (CVP) lines and pulmonary artery catheters (Mabie, 2011). The rationale for insertion, and potential complications associated with these types of invasive monitoring are summarised in Table 2-6 (page 68).

Type of invasive monitoring	Overview	Rationale for insertion	Potential Complications
Arterial line	Most commonly inserted into the radial artery although the brachial and femoral arteries may be accessed. Arterial line is attached to a transducer that produces the arterial waveform. The transducer should be level with the mid axillary line for calibration / readings. Fluid administered under pressure prevents backflow of blood and coagulation within the arterial line.	Continuous blood pressure monitoring e.g., where a woman has severe pre-eclampsia and / or she requires intra venous antihypertensives. Obtain arterial blood samples for blood gas analysis	Haemorrhage and risk of exsanguination Ischaemia Thrombosis Air embolism Skin / digit necrosis Sepsis
Central venous pressure line	Inserted into the subclavian vein, internal jugular, or femoral vein. Single and multi-lumen catheters are available. CVP line (or central venous access device (CVAD) is attached to a pressure transducer which displays CVP waveform on a monitor. The transducer should be level with the mid axillary line for calibration / readings. Pressurised fluid administration (3mls/hour) prevents backflow of blood through the catheter. Low CVP readings indicate hypovolaemia / vasodilation and high CVP readings indicate fluid overload / vasoconstriction.	Measurement of central venous pressure (CVP) i.e. right atrial filling pressure (pre-load). Also, used to provide fluid resuscitation, to counteract restricted venous access and to administer parenteral feeding.	Catheter occlusion Inaccurate readings due to poor measurement technique Pneumothorax Haemorrhage Thrombosis Perforation of the ventricle Cardiac arrhythmias. Sepsis
Pulmonary artery catheter (PAC) (Swan-Ganz catheter)	PACs commonly inserted via subclavian or jugular vein. PAC lines have multiple ports allowing for blood sampling, monitoring and an inflatable balloon at the distal end enables pulmonary artery occlusion.	Inserted where the monitoring of multiple physiological parameters is required: <ul style="list-style-type: none"> • Continuous monitoring of cardiac output. • Right atrial, right ventricular and pulmonary artery pressures • Left ventricular filling pressures • Measurement of mixed venous saturation. 	Catheter occlusion Pneumothorax Cardiac arrhythmias Arterial punctures Air embolism Thrombosis Pulmonary artery rupture Sepsis Inaccurate readings due to poor measurement technique

Table 2-6 Summary of three key types of invasive monitoring

Sources: (Booker, 2015; Carlin & Alfievic, 2008; Endacott, Jevon & Cooper, 2009; Foxall, 2009; Jevon, Ewens & Pooni, 2012; Mabie, 2011; Macintosh & Moore, 2011; McGee & Gould, 2003; Moore & Woodrow, 2009; Pacheco, 2008)

The use of PACs is controversial in terms of the impact this monitoring has on improving patient outcomes, coupled with the potential for monitoring related complications and it has been suggested that the use of PACs should be confined to use by 'critical care providers' (Pacheco, 2008). Carlin and Alfievic (2008) concur, stating that PACs are unlikely to be used in the high dependency care setting.

2.4.3.2 Patient monitoring in the context of MHDC

In 2002, Gaunt *et al.* conducted a prospective observational study utilising the National Obstetric Anaesthesia database and found that of those women classed as receiving single organ support (n=117), 9.5% received invasive BP monitoring and 16% required CVP monitoring. A retrospective audit of MHDC provision in one UK obstetric tertiary referral centre spanning a 23 year period identified that 70% of women (n= 946) received non-invasive monitoring (Saravanakumar *et al.*, 2008). This is counter intuitive as a finding given that expert opinion describes non-invasive monitoring as the “mainstay of physiological monitoring (Carlin & Alfievic, 2008, p.810). The audit also identified that 22% (n=303) of women required invasive monitoring with an arterial line, 1% (n=14) received central venous pressure (CVP) monitoring and 7% (n=96) required both (Saravanakumar *et al.*, 2008).

A more recent audit of women requiring MHDC over a 4-week period by James and Barclay (2012) identified that of the 42 women requiring MHDC, 14 (33%) required monitoring with arterial lines, a higher percentage than earlier reports suggest but this may, in part, reflect the higher prevalence of women receiving MHDC in a tertiary referral centre (Whitworth *et al.*, 2016). It may also reflect contemporary management of women with severe hypertensive / cardiac disorders where more accurate BP monitoring is indicated (Winter *et al.*, 2012).

There is a lack of robust, higher level evidence providing accurate data on the incidence of women requiring CVP and arterial line monitoring when receiving MHDC across both district general and tertiary referral OUs. Moreover, it is apparent that invasive monitoring is not an absolute feature of MHDC.

2.4.4 Multidisciplinary team working

Level 5 evidence asserts that cohesive multidisciplinary team working is the cornerstone of MHDC and involves the integration of obstetric, anaesthetic and midwifery expertise at its core (Guisse & Segel, 2008; Plaat & Wray, 2008; Rawal *et al.*, 2008; Simpson & Barker, 2008). It has been advocated in an MBRACE report examining maternal deaths in the UK, that consultants should take on the multidisciplinary team leadership role and ensure the appropriate referrals to other specialists such as haematologists, radiologists, intensivists, cardiologists and neurologists are made when women develop complications or present with complex conditions (Knight *et al.*, 2015). However, this report does not specify whether the lead clinician should be the obstetrician or anaesthetist.

A qualitative study examining midwives' recognition of acute illness and provision of MHDC (Bench, 2007) suggested that midwives receive good support from anaesthetists when undertaking MHDC and received variable levels of support from their peers depending on the labour ward skill mix and workload. This research was undertaken on a single site in one large London hospital utilising two methods of data collection and involved a small self-selected sample of midwives. The data collection tools were rigorously to promote content and face validity and the data analyses processes are clearly described. Eleven midwives completed a questionnaire and five of these (qualified < 1 year) were also interviewed. The researcher acknowledges the potential for bias as the midwives interviewed were newly qualified. However, the study findings may be transferable to midwives qualified for similar lengths of time and working in OUs of a similar size (Polit & Hungler, 1995).

2.4.5 Midwifery education and training to provide MHDC

The need for education and training for midwives to provide MHDC is undisputed given the specialist knowledge and skills that may be required for invasive monitoring and neurological assessment (Gaunt, Yentis & Holdcroft, 2002; Hardy, 2013). Expert opinion suggests varying approaches may be adopted to ensure qualified midwives receive the necessary post registration education and training to equip them to provide MHDC competently (Goebel, 2004; Hardy, 2013; Simpson & Barker, 2008).

To develop the necessary 'practical' skills midwives require for MHDC, they may rotate into a critical care unit or general HDU or receive training either from midwives specialising in MHDC, consultant obstetricians and anaesthetists and / or intensive care nurses (Billington & Stevenson, 2007; Martin & Hutchon, 2008; Saunders *et al.*, 2013; Yeadon *et al.*, 2001). External 'courses' are available that may equip midwives to deal with some, but not all facets of MHDC (e.g. Advanced Life Support Group, 2011; ALERT, 2015; ALSO UK; Resuscitation Council UK, 2015) but have significant financial implications and may not be feasible on the study budgets available in some OUs (Martin & Hutchon, 2008).

Practical training is likely to be 'competency' based and examples of competencies include airway management, care of women with invasive monitoring (e.g. arterial and central venous pressure (CVP) lines), electrocardiogram (ECG) interpretation and the recognition of common dysrhythmias (Billington & Stevenson, 2007; Hardy, 2013). However, there is limited published research nor high level evidence to suggest this is the most effective way for midwives to develop the knowledge and skills required to provide MHDC.

Recently the development of draft competencies for the care of the acutely ill woman in the OU setting have been devised by the Intercollegiate Maternal Critical Care Sub-committee of the Obstetric Anaesthetists Association (2015). The competencies are grouped into three categories (R, C and SES) using a body systems approach and it is the SES skills that relate specifically to aspects of MHDC provision:

Category R. Those that midwives should possess at the point of entry to the NMC register (e.g. protect the airway, recognise cardiovascular shock).

Category C. Core competencies that midwives working on the labour ward will use on a continuous basis (e.g. attach a patient to a cardiac monitor and identify bradycardia, tachycardia, ectopic beats).

Category SES. Specialist enhanced skills (SES) that are required by a minimum of one midwife or nurse per shift when acutely ill women receive care in the OU (e.g. assist with the insertion of a central line, prime a transducer, set appropriate alarm limits) (Intercollegiate Maternal Critical Care Sub-Committee of the Obstetric Anaesthetist Association, 2015).

These competencies offer a pragmatic solution to the competencies required by midwives providing MHDC but are not evidence based. In addition to gaining the necessary MHDC competencies, midwives face the challenge of needing to maintain their competencies, which may be difficult if they are not encountering women requiring MHDC on a regular basis (Billington & Stevenson, 2007; Hardy, 2013). The regularity with which midwives encounter women requiring MHDC may be influenced by the annual birth rate of the OU, the acuity of the local case mix and the local guidelines specifying the care pathways for ill women and indications for transfer to ICU. Based on a predicted 1.8% MHDC rate (Rajagopal *et al.*, 2011), an OU with a birth rate of

4000 per annum will encounter approximately 72 women requiring MHDC annually, a relatively small number when 'shared' between a number of different midwives who happen to be on duty when MHDC is required.

An audit completed by midwives in charge of 16 Delivery Suites in the Yorkshire region fifteen years ago identified that only n= 2 of the OUs had HDU training courses and n= 6 provided a HDU / ITU experience day (Quinn *et al.*, 2000). Half of the midwives completing the audit identified a need for increased training in MHDC with more teaching from anaesthetists. Midwives who had received MHDC training were more confident caring for women with obstetric complications but less confident with basic and invasive monitoring (Quinn *et al.*, 2000). Whilst this data is fifteen years old, Bench's qualitative study (2007) identified that midwives felt anxious when caring for critically ill women, did not consistently understand the instructions they received from doctors, and some stated they 'felt out of their depth' when asked to provide MHDC.

More recently, a survey conducted by Cockerill *et al.* (2011) involving midwives working on the Delivery Suite of a tertiary centre (n=60) identified that 64% felt they did not have adequate knowledge to care for women receiving high dependency care. Another survey of n= 137 OUs highlighted that 71% of all MHDC was undertaken by midwives and only 76% of these had received some formal training (Saunders *et al.*, 2013). This highlights that a quarter of the midwives did not have any MHDC training and all members of the multi-disciplinary team providing MHDC must maintain and update their knowledge and skills (CMACE, 2011; Lewis, 2007).

These findings may not only be specific to the UK, as it has been reported that women cared for on Australian general HDUs received more interventions and invasive monitoring compared with those receiving MHDC (Pollock, Harley and Nelson, 2011). Of these women 19% (n=9) received CVP monitoring on the general HDU compared

with 1.7% (n=1) of women on the Delivery Suite. Similarly, invasive BP monitoring was received by 47.8% women (n=22) on HDU compared with 6.9% (n=4) women on the delivery suite. Of significance, is that the women in both the general HDU cohort and the MHDC cohort had similar severity of illness scores and the authors of this study concluded: “it was not possible to determine the degree to which women in the HDU and DS settings were either over or under-serviced” leading the authors to question whether the inability of midwives to provide high dependency care had influenced their findings (Pollock, Harley & Nelson, 2011).

The increase of midwives who have undertaken direct entry midwifery programmes which requires no previous professional nursing qualification, has been raised as a concern when MHDC provision is discussed (Cockerill et al., 2011; Martin & Hutchon, 2008; Vercueil & Hopkins, 2015; Wheatly, 2010). At present, the pre-registration midwifery education curriculum is intended to develop newly qualified midwives who are skilled in providing normal midwifery care with the ability to detect deviations from normal progress throughout the childbearing continuum (Nursing and Midwifery Council, 2009).

However, the Midwives in Teaching (MINT) study commissioned by the Nursing and Midwifery Council (NMC) identified that newly qualified midwives would have preferred educational input regarding the care of women with high risk pregnancies and those requiring high dependency care during their training (Fraser et al., 2010). This finding is replicated in a recent survey of midwives working in two OUs with annual birth rates of > 5500 (Rangarajan et al., 2014). Of the 101 midwives who completed a questionnaire asking them about different facets of MHDC provision, 85% agreed that ‘critical care skill’ should be included in the pre-registration curriculum. It is acknowledged that the midwives taking part in this audit worked in large OUs providing MHDC and may therefore may not be typical of all midwives, especially those working in smaller OUs.

2.4.6 Facilities and equipment required for MHDC

A national postal survey undertaken 20 years ago examining service provision for post-operative recovery, high dependency and intensive care was completed by consultant anaesthetists responsible for obstetric anaesthesia across 262 UK OUs (Cordingley & Rubin, 1997). The response rate was 89% (n=232) and the survey ascertained that only 41% of the OUs surveyed had designated high dependency care beds on the labour ward (Cordingley & Rubin, 1997). These beds were more likely to be situated in large OUs. The authors defined small OUs as those with annual birth rates < 2900 and large OUs as those with annual birth rates > 2900, based on the median birth rate for all of the OUs combined (median annual birth rate 2900, range 250-7500). Statistically significant differences were found when comparing the availability of equipment and midwifery training required for MHDC provision. Smaller OUs were less likely to have CVP and intra-arterial blood pressure (IABP) monitoring equipment ($p<0.01$) and, less likely to train midwives in the use of ECG monitoring ($p<0.05$), CVP lines ($p<0.01$) and arterial line monitoring ($p<0.05$) (Cordingley & Rubin, 1997).

A successive self-report survey conducted in 2007 found that 56% of 159 OUs in the United Kingdom (UK) had designated high dependency beds, with a median bed provision of one per unit (Rawal *et al.*, 2008). However, the 67.6% response rate may have impacted on these findings. A repeat of the Rawal *et al* (2008) survey in 2012 had a lower response rate of 60% (n=137 OUs) and found a 1% increase in the number of OUs with designated high dependency beds, although the median number of beds per unit had increased from 1 to 2 (Saunders *et al.*, 2013). Of the OUs with designated obstetric critical care capacity 32% could not provide “one or more elements required for level 2 care e.g. arterial line management” (Saunders *et al.*, 2013).

The Birthplace in England national survey collected data from every National Health Service (NHS) Trust in the country to determine how maternity services are configured (Redshaw *et al.*, 2011). This rigorous survey determined that of 180 OUs, 49% had one or more obstetric high dependency unit (HDU) beds (Redshaw *et al.*, 2011). Rawal *et al.* (2008) have identified that where OUs do not have specific maternity high dependency beds, care is either provided in a room on the labour ward (44%), a surgical HDU (34%) or in the obstetric theatre recovery area (22%).

Professional opinion recommends that a MHDC area should include the standard non-emergency and emergency equipment all labour wards should contain, including piped oxygen and suction, infusion pumps, non-invasive monitoring equipment, resuscitation and major haemorrhage trolleys (Billington & Stevenson, 2007; Vaughan *et al.*, 2010). Professional guidelines pertaining to MHDC provision also advocate the need for specialist equipment including an intensive care monitor displaying continuous ECG and invasive monitoring waveforms, forced air warming device, blood gas analyser, and anaesthetic workstation (Maternal Critical Care Working Group, 2011; Vaughan *et al.*, 2010). However, in order to use specialist equipment staff must receive the necessary education and training.

Experts are of the opinion that smaller OUs may not have the necessary resources or pool of clinical expertise to form a “specialized team” to care for women needing higher care levels (Simpson & Barker, 2008). More recently, Scrutton and Gardner (2012) theorise that women requiring level 2 care in ‘small’ OUs are more likely to be transferred to ICU, but do not clarify what constitutes small in terms of the annual birth rate and do not justify this proposition. Correspondingly, low level evidence suggests that tertiary referral centres are more likely to provide MHDC (Murugandoss, Smith & Clarke, 2014; Ryan *et al.*, 2000; Saravanakumar *et al.*, 2008; Whitworth *et al.*, 2016).

There are signs that variations between service providers exist in terms of the facilities and equipment which are available to provide MHDC on the labour ward (Cordingley & Rubin, 1997; Williams *et al.*, 2015). These variations are likely to be influenced by an OU's annual birth rate, characteristics of the local case mix, specialist services offered (such as fetal and maternal medicine), and criteria for transfer of women to critical care units or other specialist areas such as the coronary care unit (CCU) (Cordingley & Rubin, 1997; Patil, Jigajinni & Wijayatilake, 2015; Sultan, Arulkumaran & Rhodes, 2013; Williams *et al.*, 2015). Given the aforementioned potential for variations, it is postulated that local definitions for MHDC and the defining features of this type of care may vary depending on the size of the OU.

2.5 The ambiguities surrounding MHDC in the context of the patient safety literature

The review of the literature has identified there is a lack of robust evidence confirming a precise definition for MHDC and the features that characterise the concept. Moreover, the literature suggests there may be variations between OUs with differing annual birth rates with regards to the provision of MHDC and this may have an impact on the local defining features and definition of the concept (Cordingley & Rubin, 1997; Whitworth, 2016).

Maternal safety incidents in OUs are widely publicised because SMM or maternal death may be the endpoint (Healthcare Commission, 2006; Kirkup, 2015) and when discrepancies such as those identified in relation to MHDC are exposed these constitute 'gaps' or 'ambiguities', that can lead to 'losses of information or momentum or interruptions in care delivery' (Cook, Render & Woods, 2000, p.791; Spear & Schmidhofer, 2005). The identification of 'gaps' or ambiguities in clinical practice is a vital step in the process of assessing patient safety, as illustrated in Figure 2-6.

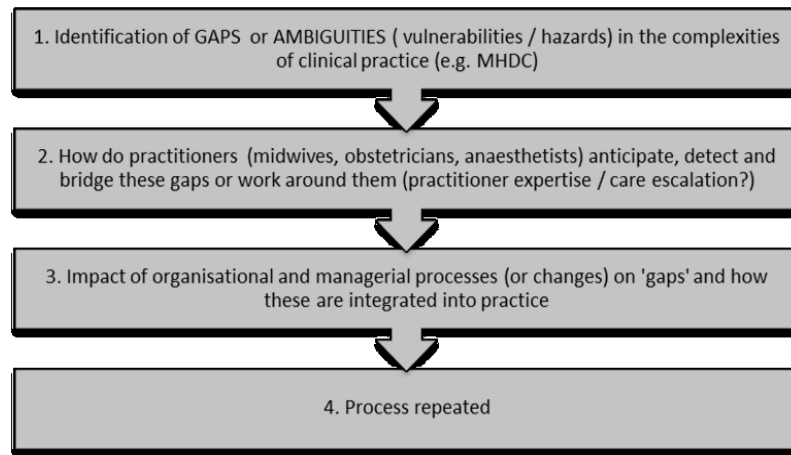


Figure 2-6 Assessment of patient safety based on Cook, Render and Woods, (2000)

Consequently, there is a need for further research that seeks to obtain agreement on the defining features of and definition for MHDC. The Delphi method, used to achieve a consensus on complex issues (Goodman, 1987) was chosen to address the research objectives (section 1.4.1) arising from the literature review. Section 2.6 presents a review of the research examining the factors that influence healthcare professionals' decisions to escalate care. This literature review underpins and informs the research undertaken during the second study phase (Focus Groups) designed to examine the factors that influence a midwife's decision to either provide MHDC or request EoC away from the OU.

2.6 An overview of the escalation of care process.

An overview of the factors that comprise the escalation of care process, drawing on literature aside from the focused review to place the concept in context, is provided in section 2.6.1.

2.6.1 The escalation of care in context; an overview

Optimum patient outcomes are achieved through the early recognition and treatment of clinical deterioration (Department of Health, 2001; Germain, Wyncoll & Nelson-Piercy,

2006; Lewis, 2004; McQuillan et al., 1998). Central to the identification and treatment of the acutely ill woman is the ability of healthcare professionals to demonstrate a combination of sound clinical decision making and situational awareness (Parush et al., 2011). Situational awareness (SA) is described as;

“Both a process of assessing a situation and the resulting analysis of that situation. SA is thought to be the most essential of non-technical skills for the achievement of safe clinical practice” (Parush et al., 2011, p.21).

Other non-technical skills include leadership, communication and teamwork (Cooper, Porter & Peach, 2014). Situational assessment and subsequent awareness, is a triphasic cyclical process, that commences when a healthcare professional gathers information that provides a background to the situation being assessed (pre-situation preparation) (Parush et al., 2011). The central ‘building and maintaining’ phase of situation assessment encompasses the comprehension of the information gathered (and being gathered) in relation to the patient, the environment, the task and timeframes, and includes a prospective component whereby the professional must think and plan ahead (Fortune et al., 2013). Finally, the professional reflects back on the process (or debriefs) when the clinical event is over. The prospective component of SA has been associated with high levels of clinical expertise as experienced professionals have greater numbers of mental models or potential courses of action to draw upon (Flin, O’connor & Crichton, 2008).

Combined with other non-technical skills SA is an important part of professionals’ recognition and management of the deteriorating patient (Cooper et al., 2012; Endacott et al., 2015). However, for those professionals who do not possess these higher level skills, robust organisational systems in the form of rapid response systems (RRS) must

be in place to reduce the levels of risk for the patient and augment individuals' SA (Reason, 2000).

2.6.1.1 Rapid response systems

Rapid response systems (RSS) encompass the strategies used to detect clinical deterioration and trigger a response (the afferent limb of the RSS system), the strategies employed to respond to the clinical deterioration (the RSS efferent limb), and also include a clinical governance / quality monitoring component (DeVita, Hillman & Bellomo, 2011; Mackintosh, Rainey & Sandall, 2012; Winters et al., 2013). RRS have been widely evaluated in terms of impact on hospital mortality and cardiac arrest rates, according to a contemporary systematic review and meta-analysis involving 29 studies hospital mortality were reduced (RR 0.87, 95% CI 0.81-0.95, $P < 0.001$) (Maharaj, Raffaele & Wendon, 2015). The use of track and trigger systems and the subsequent implementation of EoC protocols, comprise the afferent and efferent parts of RRS respectively and will be discussed in sections 2.6.1.2 – 2.6.1.5.

2.6.1.2 Track and trigger systems

Track and trigger systems (TTS) have been devised to assist professionals in recognising clinical deterioration early (National Institute for Health and Clinical Excellence, 2007). A number of different track and trigger systems are available including the Early Warning Score (EWS), Modified Early Warning Score (MEWS) and Patient at Risk (PAR) score (Goldhill et al., 2005).

Track and trigger systems work by assigning scores to clinical observations that can be routinely recorded in the ward environment. Scores rise as deviations away from normal physiological parameters occur and predetermined scores act as the trigger for professionals to initiate the appropriate referral and treatment (Goldhill *et al.*, 2005; Smith & Oakey, 2006). Single parameter and aggregate weighted scoring systems

exist (DeVita, Hillman & Bellomo, 2011). Single parameter scoring systems utilise the scoring of one physiological parameter such as the systolic blood pressure to trigger a response from clinicians. In contrast, an aggregate scoring system such as the modified early warning score (MEWS) involves the recording and scoring of five or six physiological parameters including systolic blood pressure, heart rate, respiratory rate, temperature, level of consciousness and in some instances the urine output (Gao et al., 2007b; Goldhill *et al.*, 2005; Stenhouse et al., 2000; Subbe et al., 2001). These systems require modification for use during pregnancy and the post-natal periods to compensate for the altered physiology of pregnancy (Fuschino, 1992; Lewis, 2004; Lewis, 2007; Swanton, Al-Rawi & Wee, 2009).

A pregnant woman may lose approximately one third of her circulating blood volume at term before manifesting signs of hypovolaemia, due largely to the increases in red blood cell and plasma volumes (Blackburn & Loper, 1992; Johanson et al., 2003). Complex haemodynamic changes also occur following birth with cardiac output only returning to non pregnant values between two and four weeks later (Blackburn & Loper, 1992). It is recommended that Modified Early Obstetric Warning Systems (MEOWS) are used for all acute obstetric admissions in order to detect maternal critical illness early and reduce severe maternal morbidity and prevent maternal death (Centre for Maternal and Child Enquiries, 2011; Lewis, 2007).

In 2007, a survey of Lead Obstetric Anaesthetists working in OUs highlighted that, of the 159 participants who returned the questionnaires (71% response rate), only 19% (n=30) of the OUs represented used some form of obstetric EWS and 6% (n=9) used MEOWS (Isaacs et al., 2014; Swanton, Al-Rawi & Wee, 2009). In contrast, a follow up survey in 2012-2013 identified a dramatic upturn in the use of MEOWS in OUs with all Lead Obstetric Anaesthetists (n=130) reporting usage, although variations between

OUs as to the type of scoring systems used and indications for their use were evident (Isaacs *et al.*, 2014).

A study to validate MEOWs for the pregnant population involving a prospective review of 676 obstetric admissions and their associated MEOWS charts concluded that MEOWS had a “high sensitivity and reasonable specificity”¹ when using early signs of morbidity as the trigger (Singh *et al.*, 2012, p.15). It was acknowledged by Singh *et al.* (2012) that the lack of definitive parameters representing obstetric morbidity was a limitation of their study and that there was potential for population bias as this was a single site study in a tertiary referral centre. However, this study does provide evidence relating to the accuracy of MEOWs in this specific population.

In order for TTS to work effectively, the correct clinical observations need to be recorded accurately, at the appropriate frequency, and the scores calculated correctly and evidence suggests this may not always happen (Austin *et al.*, 2014; Donohue & Endacott, 2010; Jonsson *et al.*, 2011; Singh *et al.*, 2012; Smith & Oakey, 2006). To reduce calculation errors, the use of computers to determine a patient’s early warning score by the bedside has been suggested as a viable option and provides an electronic alert system when an abnormal early warning scores is identified (Mackintosh, Rainey & Sandall, 2012; Mohammed *et al.*, 2009). However, it is unknown how widely this type of system has been adopted across the UK as there is limited published evidence.

Whilst TTS cannot totally replace the need for clinical judgement, they may enhance the referral process between midwives and doctors by providing an objective and unambiguous means of communicating the presence of clinical deterioration (Andrews & Waterman, 2005; Dutton, 2012; Gao *et al.*, 2007b; Mackintosh, Rainey & Sandall,

¹ Sensitivity refers to the proportion of women with predefined morbidity who triggered the MEOWS chart whilst specificity refers to the proportion of women *without* predefined morbidity who triggered the MEOWS chart.

2012). A graded response strategy or EoC protocol is required for abnormal EWS scores, in order that patients receive appropriate care, by professionals with the requisite expertise and skills in the appropriate timeframe (Centre for Maternal and Child Enquiries, 2011; Department of Health, 2009; Mackintosh, Rainey & Sandall, 2012; Maternal Critical Care Working Group, 2011; The Truax Group, 2009).

2.6.1.3 Escalation of care protocols

Clinical protocols and guidelines operationalise evidence-based practice and are designed to improve uniformity of approach between professionals and enhance clinical decision making (Fervers, Carretier & Bataillard, 2010; Mead, 2000; Natsch & van der Meer, 2003; Parush *et al.*, 2011; Penney & Foy, 2007). Examples of hospital EoC protocols are available in the public domain (Maternal Critical Care Working Group, 2011). As a patient's clinical situation worsens and EWS score increases, the degree of urgency with which assistance is called, and the seniority of those called to assist will increase (Dutton, 2012; National Institute for Health and Clinical Excellence, 2007).

A framework of competencies termed the 'chain of response' has been designed to clarify the roles and responsibilities and competencies required by the hospital multidisciplinary team when assessing acutely ill patients, thereby helping to ensure that care is escalated appropriately (Department of Health, 2009). At present, there is no available evidence evaluating the use and effectiveness of such competencies in terms of patient outcomes. Based on the Department of Health (2009) framework, the chain of response in an OU setting may include:

- Maternity care assistants or midwives who monitor a woman's physiological condition (recorder role)

- Midwives or junior doctors who interpret the measurements taken by the recorder (recogniser role)
- Junior doctor / Speciality Registrar in obstetrics or anaesthetics who initiates a management plan (primary responder)
- Speciality Registrar / consultant obstetricians / and or anaesthetists (who instigate more complex treatments for the woman who continues to deteriorate) and possess high levels of clinical expertise and critical care skills (secondary and tertiary responders).

According to level five evidence, EoC protocols should include local guidance as to when specialists such as the Critical Care Outreach Team (CCOT) or Medical Emergency Team (MET) should be contacted and the transfer of a woman to a specialist clinical area other than the OU is required (Dutton, 2012; Maternal Critical Care Working Group, 2011).

2.6.1.4 Critical care outreach and Medical Emergency Teams

Critical Care Outreach teams were introduced to ensure patients suffering physiological deterioration are identified and dealt with promptly, and admission to ICU is either avoided or initiated in a timely fashion (Department of Health, 2000). Variants on CCOTs include the MET, Patient at Risk Team (PART) and postoperative care team (Cutler & Robson, 2006; Marsh & Pittard, 2012). The professional composition of CCOTs may vary between hospitals with some nurse led whilst others may be medically led (McDonnell et al., 2007). Patients with abnormal vital signs who require input from a CCOT, but do not need a higher level of care have been classed as receiving level one care (ICS, 2009).

Critical Care Outreach teams (or equivalent) form an important link in the RRS chain and have been widely evaluated in general hospital settings, but less so in OUs (Al Kadri, 2010; Barrett & Yentis, 2008). The implementation of CCOTs has been shown to reduce the need for in hospital CPR through the timely detection and treatment of physiological deterioration (Gao *et al.*, 2007a; Laurens & Dwyer, 2011; Moon *et al.*, 2011). Studies also report a decreased number of unexpected hospital deaths following the implementation of CCOTs or their equivalent (Laurens & Dwyer, 2011; McGaughey *et al.*, 2007; Moon *et al.*, 2011). However, the aforementioned benefits of CCOTs have also been disputed (Kenward *et al.*, 2004; McGaughey *et al.*, 2007; Merit study investigators, 2005).

Despite the ongoing debate about the impact CCOTs have on patient outcomes, CCOTs also provide an educational and supportive function for ward staff (Chellel, Higgs & Scholes, 2006; Department of Health, 2000; Gao *et al.*, 2007a). A qualitative study identified that CCOT nurses were instrumental in helping and educating ward nurses to assist with the setting up and use of equipment such as CVP lines and non-invasive ventilation (Chellel, Higgs & Scholes, 2006). CCOT nurses also assisted in clinical decision making processes and were seen as experts who were able to “orchestrate” others members of the MDT in the management of acutely ill patients (Chellel, Higgs & Scholes, 2006), a finding replicated by a successive qualitative study (Donohue & Endacott, 2010). However, there are no studies evaluating this type of care in OUs.

2.6.1.5 Failure to rescue

The quality-monitoring component of RSS is crucial in identifying and examining cases of failure to rescue and improving future clinical care (Mackintosh, Rainey & Sandall, 2012). The term ‘failure to rescue’ (FTR) is used to identify patient mortality or an

adverse event such as SMM has occurred because one or more aspects of the escalation process has failed (Clarke & Aiken, 2003; Johnston et al., 2014; Johnston et al., 2015; Subbe & Welch, 2013).

2.6.2 The factors that influence health care professionals to escalate care

The primary research informing this review are summarised in Appendix one (Table A1-5) and are discussed in sections 2.6.2.1- 2.6.2.4 below.

An ethnographic mixed methods study conducted by the National Patient Safety Agency (NPSA) using multiple data collection methods (focus groups with doctors and nurses, an ethnographic observational study conducted on four acute hospital wards and aggregate root cause analysis of deterioration incidents) examined the factors that predispose deterioration incidents (National Patient Safety Agency, 2007). The use of multiple data collection methods promotes rigour in this study (Creswell, 2003), although the researchers suggest a limitation is the “small numbers of staff and sites” (National Patient Safety Agency, 2007, p. 13). Nonetheless, ethnographic studies are well suited to examining behaviours and actions in a participant’s own environment, and are particularly well suited to observing complex phenomenon such as the EoC (Matthews & Ross, 2010). The study emphasised the multifactorial nature of failure to rescue and highlights factors that can negatively influence the EoC process. These factors are summarised in Table 2-7 and form the basis of the discussions.

Theme	Examples of issues that predispose failure to rescue events
Rapid Response Systems	Perception that the recording of observations is a low priority Lack of education and training regarding EWS completion
Escalation protocols	Lack of guidelines / staff may be unaware of guidelines
Staff factors / multidisciplinary teamworking	Tired staff Staffing levels suboptimal High workloads Junior staff may lack intuitive component of detecting deterioration Barriers to teamworking – limited / no knowledge of team members, professional hierarchy.
Communication Issues	Inadequate handover of care. Poor communication between members of the multidisciplinary team Information problems relating to patients classed as outliers.
Patient factors	Appearance of patient may not equate with severity of illness (subtle signs of deterioration) Patient may not be compliant and refuse monitoring
Equipment	Insufficient equipment to record observations Over reliance on equipment to assess patients

Table 2-7 Causes of failure to rescue as identified by the NPSA (2007)

2.6.2.1 Rapid Response Systems and escalation protocols

Rapid response systems have been identified in section 2.6.1.1 as pivotal in assisting healthcare professionals to recognise deterioration and escalate care. Impediments to timely EoC, attributed to suboptimal completion of track and trigger systems has been identified by the NPSA (2007) and successive studies (Endacott et al., 2007; Johnston *et al.*, 2015; Mackintosh et al., 2014).

Endacott et al. (2007) conducted a multi methods study using a case study approach in an Australian regional hospital which examined the case notes of n=17 patients admitted unexpectedly to ICU over a four-month period. Interviews with n=11 nurses and n=14 doctors involved in the care of these patients were also completed and analysed. The study shows congruence between the research methods and the study aims, illustrations from the data reinforce the study findings and comprises level two evidence in relation to ‘meaningfulness’ (Joanna Briggs Institute, 2016). High staff workloads, inadequate staffing / skill mix and locum staff were found to have a negative

impact on professionals' abilities to detect the degree of clinical deterioration due to inaccurate completion of EWS and poor reporting along the chain of response, as identified by other researchers (Endacott *et al.*, 2007; Johnston *et al.*, 2015; National Patient Safety Agency, 2007; Wakeam *et al.*, 2014). Moreover, due to periods of high clinical activity, patient monitoring and completion of EWS systems may be interrupted or prioritised as being of low importance, when compared with other clinical responsibilities (Chua *et al.*, 2013; Mackintosh *et al.*, 2014; National Patient Safety Agency, 2007).

The 2011 Confidential Enquiry into Maternal Deaths report identified midwifery failings and substandard care relating to deaths from sepsis as midwives failed to record or incompletely recorded maternal observations and did not chart observations on a MEOWS chart (Centre for Maternal and Child Enquiries, 2011). As a result, the appropriate EoC did not occur and the authors concluded:

"It is possible that the focus on 'normality' within maternity has had entirely unintended consequences with these core tasks not being undertaken rigorously. Maternity services should have appropriate guidelines and / or policies in place stipulating clear processes for the escalation of care when clinical deterioration is detected."

(Centre for Maternal and Child Enquiries, 2011, p.42)

A cross sectional survey of Heads of Midwifery in the UK (n= 107) identified that barriers to midwives using EWS systems included their overlap with the use of the partogram (n=46), a lack of training (n=23) and staff shortages (n=21) (Bick *et al.*, 2014). This survey highlights that additional factors contribute to 'midwifery failings' and reflects issues that have been reported elsewhere (Mackintosh *et al.*, 2014). Mackintosh *et al.* (2014) collected over 120 hours of observational data, reviewed patient records and completed 45 semi-structured interviews with doctors, midwives

and managers over a seven-month period in two large OUs with annual birth rates of 6000 for their rigorous ethnographic study examining the value of MEOWs during the peripartum period. Key findings included the overlap of the EWS with the partogram and midwives' selective completion of MEOWs when faced with competing professional demands (Mackintosh *et al.*, 2014). The study also suggests that midwives in one of the OUs in this study were reluctant to call the CCOT to facilitate escalation of care despite its existence, associating it with general acute care as opposed to maternity care (Mackintosh *et al.*, 2014).

With regards to the escalation protocols, studies suggest these are not always in place, may be difficult to comprehend or staff are unaware such guidance exists (Johnston *et al.*, 2014; National Patient Safety Agency, 2007). Moreover, the adherence to such protocols may be hampered by professional hierarchies and professionals' fear of reprise for escalating care too early (Johnston *et al.*, 2014; Mackintosh & Sandall, 2010). However, a double blinded randomised controlled trial has demonstrated that the introduction of a short educational session encouraging a systematic approach to EoC by junior surgeons, improved their ability to assess patients accurately and communicate effectively during simulated patient deterioration scenarios (Johnston *et al.*, 2016).

2.6.2.2 Staff factors, multidisciplinary teamworking and communication

Poor team working and a lack of trust between team members has been identified as a contributing factor in patient deterioration incidents (National Patient Safety Agency, 2007). Confusion regarding lines of responsibility and communications relating to patients classed as outliers (e.g. a patient admitted as a surgical patient is placed on a medical ward) has also been identified as an impediment to the EoC (National Patient Safety Agency, 2007).

The importance of professionals having a good “rapport” with senior team members has been identified as an important factor when staff want to escalate care (Johnston, 2014, p. 991). This may explain why locum staff negatively influence the EoC process (Endacott *et al.*, 2007), as they are less likely to be known well by permanent team members. Staffing ‘discontinuity’ has also been cited as a cause of deterioration incidents due to underpinning communication failures and confusion regarding lines of responsibility and accountability (Wakeam *et al.*, 2014, p 506).

Evidence also suggests that clinical inexperience can also contribute to failure to rescue incidents (Endacott *et al.*, 2007; Johnston *et al.*, 2015; National Patient Safety Agency, 2007; Smith & Aitken, 2016; Wakeam *et al.*, 2014). Professionals that are clinically inexperienced may lack the intuitive component of decision making and have less mental models to draw upon (Callaghan *et al.*, 2016). Staff must also have the appropriate equipment available to them to monitor patients correctly (National Patient Safety Agency, 2007).

2.6.2.3 Patient factors

Track and trigger systems have been introduced to detect physiological deterioration in an objective manner, however healthcare professionals also conduct assessments by observing the patient, and this may lead to error when ‘subtle’ signs are missed or the patient is not perceived as being ill enough to warrant care escalation (Johnston *et al.*, 2015; National Patient Safety Agency, 2007; Rotella *et al.*, 2014). A systematic review also identifies that patients’ relatives may identify concerns about changes in the clinical condition of their family member and bring this to the attention of healthcare professionals, in what has been termed family EoC (Gill, Leslie & Marshall, 2016). Further investigation into the impact this intervention may have on patient outcomes and how it is formally integrated into RRSs is required (Gill, Leslie & Marshall, 2016).

Rotella *et al.* (2014) conducted a survey of Junior Medical Officers (JMOs) to examine the factors that influence their decisions to escalate care in one Australian tertiary level hospital. Fifty JMOs completed the survey asking them to rate their level of agreement on a five point Likert scale against eighteen statements about the EoC, developed from the literature. The questionnaire was piloted, increasing the internal validity of the research. Ninety two percent of JMOs agreed they were more likely to escalate care when they were unfamiliar “with the patient’s clinical problem” and 94% agreed they were more likely to escalate care when “there is uncertainty about diagnosis or management” (Rotella *et al.*, 2014, p.725). Where a patient’s condition was not getting better or there was deterioration, the JMOs were likely to escalate care “often” (Rotella *et al.*, 2014, p.727). The 100% response rate (n=50) is a strength of this survey, although the researchers caution it was conducted on a single site which may limit its generalisability (Rotella *et al.*, 2014).

2.6.2.4 Summary of the Escalation of Care literature review

The combination of a healthcare professional’s SA and utilisation of RRS to detect the deteriorating or acutely ill patient, will have a significant impact on the EoC decisions that are made (section 2.6.1). However, a significant proportion of studies relating to the factors that influence professionals’ EoC decisions (not focused exclusively on RRS), centre on the concept of failure to rescue and the circumstances leading to this (Johnston *et al.*, 2014; National Patient Safety Agency, 2007; Smith & Aitken, 2016). However, these studies provide valuable insight into the factors that do influence, albeit negatively, healthcare professionals’ EoC decision making. Furthermore, the limited amount of midwifery research examining this aspect of clinical practice is evident.

2.7 Chapter Synopsis

There is a dearth of high quality evidence providing information on the defining features of, and definition for MHDC and the available evidence highlights there is heterogeneity in terms of the definition for MHDC and no robust evidence identifying the defining features of the concept. These uncertainties constitute 'gaps' or 'ambiguities' and encompass 'losses of information or momentum and interruptions in care delivery' (Cook, Render & Woods, 2000, p.791; Spear & Schmidhofer, 2005). As a consequence, there appears to be a strong need to obtain a professional consensus on the definition and defining features of MHDC (Research aim i; Delphi survey objectives 1 & 2). The Delphi method is a robust method for gaining consensus on complex issues and has not been used to examine MHDC previously (Hasson & Keeney, 2011).

Moreover, the limited low level evidence available, suggests there may be variations between OUs with different annual birth rates with regard to the defining features of MHDC and how it is provided (Cordingley & Rubin, 1997) (Delphi survey objective 3). It is also apparent there is ongoing professional debate regarding how midwives should be educated pre and post registration in order to provide this type of care and, that some midwives feel inadequately prepared to provide MHDC. Consequently, it is not known if midwives' perceptions of MHDC are the same as those of their medical colleagues (Delphi survey objective 4).

The literature review conducted to examine the factors that influence the EoC by healthcare professionals, identified there is higher level research addressing this concept. However, only a limited amount of this evidence is situated in the context of maternity care provision, and is an area of midwifery practice that merits further investigation, especially in the context of the acutely ill woman who requires MHDC (Research Aim ii). In light of the gaps that have been identified from the literature, the

next chapter outlines the research design and methods utilised to address the study aims and objectives stated in section 1.4.1.

Chapter 3 Research design, methods and philosophical underpinnings

3.0 Introduction

This chapter examines the ontological and epistemological underpinnings of the research undertaken and provides a discourse related to the research design and methods used to meet the research objectives. The first (Delphi) and second (Focus Groups) study phases used a combination of mixed methods (Tashakkori & Teddlie, 2010). The philosophical underpinnings of the research and mixed methods research will be presented. Subsequently the research methods used for both study phases will be described in detail, including the sample selection and recruitment procedures, data collection and analyses and ethical considerations.

The first study phase employed the Delphi survey method because consensus methods have not been used to examine the concept of MHDC previously. Furthermore, the published evidence offering definitions for MHDC comprise low level evidence, mainly observational descriptive designs and expert opinion. The second study phase (Focus Groups) built on the Delphi survey findings with a complementarity purpose, to examine the factors that influence midwives' decisions to provide MHDC for an acutely ill woman or escalate her care away from the OU.

3.1 Ontology and epistemology

Ontology is defined by Grix (2001, p 238) as a "branch of metaphysics concerned with the nature of being" and what constitutes social reality (Grix, 2001; Scotland, 2012). In contrast, the researcher's epistemological assumptions may be defined as "how knowledge can be created, acquired and communicated" (Scotland, 2012, p 9). The ontological and epistemological assumptions made by a researcher will influence the

researcher's choice of methodology and methods (Crotty, 1998; Grix, 2001; Grix, 2004). The terms methodology and methods may be used interchangeably in the literature. For the purpose of this discussion, the term methodology will be used to describe the overall research process or design, whilst the term 'methods', will be used to specify the ways in which the data are collected and analysed (Scotland, 2012).

The ontological position of objectivism asserts "social phenomena and their meaning have an existence that is independent of social actors" (Grix, 2004, p61). In contrast 'constructivism' embraces the way individuals interpret phenomena in different ways, that is, their interpretations are socially constructed (Grix, 2004; Scotland, 2012).

Objectivism underpins the positivist epistemological paradigm whilst constructivism translates into the interpretivist or constructivist paradigm (Crotty, 1998). Historically these paradigms have been viewed as dichotomous entities underpinning quantitative and qualitative research methodologies however, in addition to the positivist and interpretivist paradigms, the transformative and pragmatic paradigms are increasingly accepted and used by researchers (Johnson & Onwuegbuzie, 2004; Mackenzie & Knipe, 2006).

The pragmatic paradigm is described as being "problem-centred" and aligned with "real world' practice" (Mackenzie & Knipe, 2006, p.4). The pragmatic paradigm emphasises that information from "everyday experience is as important as information from prior research and theory" and multiple perspectives can inform the issue under investigation (Tashakkori & Teddlie, 2010, p.139). The pragmatic paradigm underpins mixed methods research where a complementary amalgamation of positivism and interpretivism occurs (Creswell, 2003; Johnson & Onwuegbuzie, 2004). The paradigmatic assumptions underpinning pragmatism align closely with the ethos of this study and its research objectives, designed to examine MHDC and the EoC from a

clinically based stance, involving the maternity care professionals who possess the real-world knowledge and in-depth understanding of these concepts (Johnson & Onwuegbuzie, 2004).

The ontological and epistemological underpinnings of Delphi surveys are subject to extensive debate, however, it is argued that the specific aims of a study are likely to influence the philosophical approaches taken by the researcher (Hanfin, 2004; Keeney, Hasson & McKenna, 2011; Sackman, 1975). In terms of the philosophical methods of inquiry that underpin Delphi research, Mitroff and Turoff (1975) provide a complex dialogue related to this and suggest five philosophical methods of inquiry (Leibnizian, Lockean, Kantian, Hegelian and Singerian) that may underpin the 'interpretivist' aspect. The 'Kantian' Delphi;

"attempts to design a structure which allows many "informed" individuals in different disciplines or specialties to contribute information or judgments to a problem area which is much broader in scope than the knowledge that any one of the individuals possesses" (Mitroff and Turoff, 1975, p27).

In the initial round(s) of a Delphi survey, gaining consensus is not the main goal, but eliciting the views of all parties (which may be divergent) is fundamental (Mitroff and Turoff, 1975). Delphi research based upon Kantian philosophy may cultivate more than one answer to the subject under consideration (Keeney, Hasson & McKenna, 2011).

The round 1 question in this Delphi survey was broad and open ended in order to seek the comprehensive views of those involved in MHDC provision. This approach, based on a 'Kantian' philosophical approach, encouraged individuality of responses and enabled the researcher to discover divergent opinions at the beginning of the survey (Mitroff & Turoff, 1975). The acquisition of the respondents' subjective judgements regarding MHDC during the first round of the survey encompassed an interpretivist

approach. In contrast, the harnessing of the respondents' subjective judgements using Likert type items to determine a statistically generated consensus in the second and third rounds, was representative of the positivist paradigm (Bramwell & Hykawy, 1999; Hasson, Keeney & McKenna, 2000; Keeney, Hasson & McKenna, 2011; McKenna, 1994; 1995; Pill, 1971). The aforementioned reduction of data reinforces the argument that Delphi studies may also fall under the umbrella of positivism (Sackman, 1975).

Underpinned by an interpretivist paradigm, the second phase, using video vignettes to stimulate focus group discussions, examined the factors that influence midwives' decisions to provide MHDC or request the EoC. Focus groups were used to acquire rich qualitative data and a framework method was used to analyse the data generated (Gale *et al.*, 2013; 1995; Smith & Firth, 2011). This approach is a recognised feature of the pragmatic paradigm where, the researcher seeks to find workable solutions to problems and follows up findings and leads using the most appropriate methods to answer the research questions raised (Greene, Caracelli & Graham, 1989; Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie & Turner, 2007).

3.2. Mixed methods research

Mixed methods research involves "the combination of qualitative and quantitative approaches into the research methodology of a single study or multiphased study" (Plano Clark & Creswell, 2008, p.21). Qualitative research focuses on gaining in depth understanding about a phenomenon and aims to gain rich insight into the thoughts and feelings of individuals (Rees, 1997). Contrastingly, quantitative research tests theories, observes and measures information numerically, and uses statistical tests (Creswell, 2003, p.19). A strength of mixed methods research is that it is designed around the questions that need answering, as opposed to the researcher attempting to 'fit' the

questions into a single paradigm (Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie & Turner, 2007).

Mixed methods research enables the researcher to draw on the strengths of both qualitative and quantitative approaches and to examine phenomenon that are complex and multifaceted in greater depth than if a single qualitative or quantitative approach were used (Andrew & Halcomb, 2009; Creswell, 2015; Feilzer, 2010; Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2010). Creswell (2015) cautions however, that it is unacceptable to simply add qualitative and quantitative data together and label this a mixed methods design, stating that integration of the two data sets are paramount.

There are five main purposes for using mixed method designs and these include triangulation, complementarity, development, initiation and expansion (Greene, Caracelli & Graham, 1989; Johnson & Onwuegbuzie, 2004). Triangulation aims for “convergence or corroboration” of findings, complementarity “seeks elaboration, enhancement, illustration, clarification of results” and development “seeks to use the results from one method to help develop or inform the other method” (Greene, Caracelli & Graham, 1989, p.259). The purpose of initiation is to “seek the discovery of paradox and contradiction” whereas expansion “seeks to extend the breadth and range of inquiry by using different methods for different enquiry components” (Greene, Caracelli & Graham, 1989, p.259). Researchers may have more than one specified purpose when undertaking mixed methods research and this is guided by the research objectives (Plano Clark & Creswell, 2008).

Creswell (2003, p211) identifies four key aspects that must be considered in relation to the planning of mixed methods research, the implementation sequence of quantitative

and qualitative data collection, the priority given to the quantitative and qualitative data collection and analyses, when the data and findings are integrated and whether a theoretical perspective is used. These aspects are addressed below, as relating to this study.

3.2.1 Implementation sequence and prioritisation

Key decisions made by researchers embarking on mixed methods research includes whether the quantitative or qualitative aspects are evenly or unevenly prioritised or ‘weighted’ and the way in which the qualitative and quantitative components are combined or mixed, alternatively termed the implementation sequence (Creswell, 2003). These are important considerations in ensuring that the limitations of one method are balanced by the strengths of another (Andrew & Halcomb, 2009). The research objectives will drive the decisions made by the researcher regarding prioritisation and the implementation sequence and these decisions will dictate the overarching study design (Tashakkori & Teddlie, 2010).

There are three main types of mixed methods designs; the convergent design, the explanatory sequential design and the exploratory sequential design (Creswell, 2003; Creswell, 2015; Plano Clark & Creswell, 2008). Convergent designs collect and analyse the quantitative and qualitative data sets separately, subsequently merging the findings through the drawing of comparisons and inferences (Creswell, 2015, p36-37). The explanatory sequential design involves the collection of quantitative data followed by a second qualitative phase specifically designed to explain the initial quantitative findings (Creswell, 2015, p38). This research broadly reflects an “exploratory sequential” mixed methods design, with qualitative data collection and analyses being followed sequentially by quantitative data collection and analyses, followed by further qualitative data collection and analyses (Andrew & Halcomb, 2009; Creswell, 2015,

p.6). The final qualitative focus group study exploring midwives' EoC decisions fulfilled a complementarity purpose, that is, it was designed to elaborate upon and clarify findings that emerged from the Delphi survey (Greene, Caracelli & Graham, 1989; Teddlie & Tashakkori, 2009) and contribute to the EoC literature related to MHDC.

The sequence of data collection and analyses undertaken during the two study phases (Delphi survey and Focus Groups study) are summarised in Figure 3-1 and shows the weightings placed on the quantitative and qualitative components. Exploratory sequential designs place greater weighting on the qualitative processes, with the quantitative data collection and analyses being used to “assist in the interpretation of the qualitative findings” (Creswell, 2003 p.215).

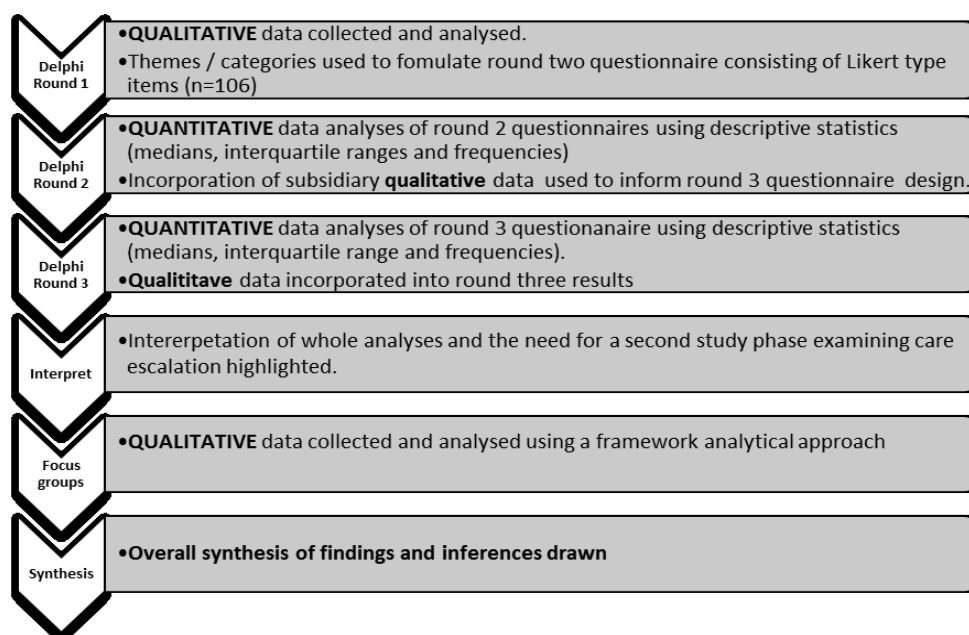


Figure 3-1 Sequence of data collection and analyses for the two study phases

3.2.2 Integration

The integration of the quantitative and qualitative components in a mixed method study is flexible and may occur at one or several junctures (Andrew & Halcomb, 2009; Creswell, 2003). In this exploratory sequential design integration occurred between the

first and second rounds of the Delphi survey where the first round qualitative findings were used to develop the second round questionnaire. Integration also occurred between the second and third rounds of the Delphi survey where the respondents' second round quantitative and qualitative findings informed the design of the third round questionnaire. Further mixing occurred following the Focus Group study when the qualitative findings exploring EoC from a midwifery perspective were used to elaborate upon and explain key findings arising from the Delphi survey.

3.2.3 Theoretical perspective

Maternity care providers have a duty to provide high quality care that is safe and responsive to the needs of mothers, babies and families (Department of Health, 2004; Department of Health and Partnerships for Children Families and Maternity, 2007; NHS England, 2016a). The Delphi survey was designed to gain a consensus as to what constitutes MHDC, as it has been identified from the literature that there are a number of ambiguities surrounding this important aspect of maternity service provision. When considered in the broader context of patient safety, the presence of ambiguities in care provision increases the potential for clinical error, adverse incidents and severe maternal morbidity (Dekker, 2011; Reason, 2000; Say, Souza & Pattinson, 2009). To date, no consensus methods have been used to examine this aspect of care.

3.3 Study phase one (Delphi Survey)

3.3.1 Delphi background and rationale for choosing the method.

First used in the early 1950s by the 'RAND' corporation in the United States of America to research military defence issues, the Delphi technique has steadily grown in popularity (Beech, 2005; Keeney, Hasson & McKenna, 2011). The Delphi technique was initially developed as a method of technological forecasting but is now used for

other purposes including policy development, health and educational research (Beech, 2005; Goodman, 1987; Linstone & Turoff, 1975; McKenna, 1994). Key features of Delphi studies include the formation of an expert or 'informed' panel, anonymity of participants, iteration, controlled feedback, and statistical aggregation of group response (Linstone & Turoff, 1975; McKenna, 1994; Powell, 2003; Rowe & Wright, 1999; Sackman, 1975).

Delphi studies are undertaken in a series of 'rounds' or 'iterations' and the data gathered may either be quantitative or qualitative, or a combination of both (Bramwell & Hykawy, 1999; Fink et al., 1984; Linstone & Turoff, 1975; Sackman, 1975). The Delphi method is suited to examining complex issues in health and social care where agreement is sought (Keeney, Hasson & McKenna, 2011) and its main purpose is to gain consensus of opinion about an issue where there is contention (Murphy et al., 1998). Therefore, the Delphi method was chosen to seek consensus on the definition and defining features of MHDC as the limited published literature identifies differing opinions (Delphi Research Objectives 1 & 2, section 1.4.1). The Delphi method enables the researcher to gather divergent personal opinions and through a systematic process, gain group consensus (Hasson, Keeney & McKenna, 2000).

It is suggested that MHDC provision may vary between OUs with different annual birth rates and facilities (Cordingley & Rubin, 1997; Wheatly, 2010) thus identifying the importance to seek and compare the opinions of professionals working in OUs with differing annual birth rates (Delphi Research Objective 3). The OUs chosen (section 3.3.2) were situated over a large geographical area remote from the nearest tertiary referral centre (Figure 3-2, p103). The Delphi method is advantageous when an issue 'benefits from subjective judgements on a collective basis' and 'more individuals are needed than can effectively interact in a face to face exchange' (Yousef, 2007).

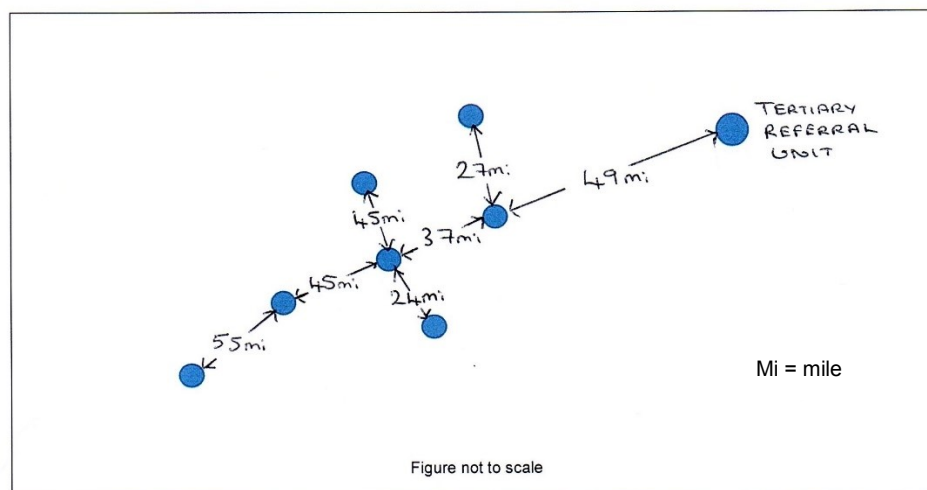


Figure 3-2 Distances between the seven OUs and tertiary referral unit

3.3.2 Study setting

Seven OUs situated in Southern England (Table 3-1) were accessed to provide a source of relevant experts for the Delphi survey. The annual birth rates for the OUs were chosen as they were representative of District General Hospitals in the same region, but had lower rates than the tertiary referral unit situated a large geographical distance away from each OU (Figure 3-2). Some of the OUs were situated in relatively rural locations, and OUs (A-D) were situated in areas that were more densely populated, but served both urban and rural populaces.

Obstetric Unit	Type of Unit	Approximate number of births per annum, at time of survey commencing	Neonatal facilities	Number of delivery beds	Number of MHDC beds
A	Obstetric Unit / Alongside Midwifery Led Unit	3300	Local Neonatal Unit (LNU)	9	Not specified
B	Obstetric Unit / Freestanding Midwifery Led Unit	3300	LNU	9	1
C	Obstetric Unit including midwifery led care.	4000	LNU	9	1
D	Obstetric Unit including midwifery led care.	4500	Neonatal Intensive Care (NICU)	10	2
E	Obstetric Unit including midwifery led care.	1700	Special Care Unit (SCU)	6	0
F	Obstetric Unit including midwifery led care.	2200	SCU	8	0
G	Obstetric Unit including midwifery led care.	1500	SCU	5	0

Table 3-1 Characteristics of the seven OUs where the respondents worked.

The 7 OUs were selected to reflect a wide and varied service provision. All OUs had twenty-four-hour cover by both obstetricians and anaesthetists. The birth rates ranged from approximately 1500 to 4500 per annum and catered for a combination of women requiring high and low risk care. Units A and B are classed as category B OUs whilst units C and D comprise category C1 OUs (Royal College of Anaesthetists *et al.*, 2007). Units E, F and G are classed as low volume OUs (Cordingley & Rubin, 1997). All of the OUs had facilities to care for sick neonates. The OUs with the lowest annual birth rates had Special Care Units (SCUs), 3 OUs had local neonatal units (LNU) and the largest OU (unit D) had a neonatal intensive care unit (NICU). None of the OUs were tertiary referral centres and none had a designated team of 'critical care' midwives to provide MHDC. The researcher chose OUs that were not tertiary referral centres as low level evidence suggests that these may be better equipped to provide MHDC whilst smaller OUs may be more likely to escalate care away from the OU, as discussed previously in section 2.4.6.

3.3.3 Formation of an expert panel

The 'expert' panel is subject to debate in terms of defining the characteristics that 'make' an expert and the number of 'experts' required to form a Delphi panel (Baker, Lovell & Harris, 2006). Experts can be defined by their years of experience in a particular occupation, their job titles, and their educational / professional qualifications or a combination of these (Baker, Lovell & Harris, 2006; Keeney, Hasson & McKenna, 2011; Mullen, 2000). Alternative terms for the experts making up a Delphi panel include "informed individuals" (McKenna, 1994, p 1221), those with a vested interest in the topic under consideration, those with sufficient expertise, and informed experts. (Broomfield & Humphris, 2001; Mullen, 2000).

MHDC is a complex phenomenon delivered by a core group of obstetricians, anaesthetists and midwives (Vaughan *et al.*, 2010). It was essential to centre the Delphi survey around these professional groups and include staff with differing levels of experience, expertise and roles (e.g. clinical, managerial / strategic, educational and governance roles) in order to obtain a true reflection of MHDC provision. In totality, these professionals comprehensively reflect the 'real world' views of the OU team who provide MHDC (either directly in terms of 'hands on care' or indirectly) (Centre for Maternal and Child Enquiries, 2011; Lewis, 2004). A rationale for the inclusion of each expert is provided in Table 3-2.

Expert Title	Rationale / criteria for inclusion
Midwife working clinically on the labour ward (band 6)	Provides direct midwifery care on a day-to-day basis.
Midwife co-ordinating the labour ward (band 7)	In charge of the day-to-day running of the labour ward. Key member of the multi-disciplinary team involved in caring for the critically ill obstetric patient.
Labour Ward Manager / Labour Ward Matron / or equivalent title	Overarching managerial responsibility for the labour ward and organisation of care provision
Head of Midwifery / or equivalent title	Strategic / financial overview of the maternity services
Practice Development / Education Midwife / or equivalent title	Overview of local midwifery education and training needs
Supervisor of Midwives	Statutory function to promote public safety and support midwives in their practice (LSAMO National Forum UK, 2009)
Midwifery Risk Manager / equivalent title	Overview of adverse clinical incidents and in depth understanding of Clinical Governance issues related to clinical care provision
Consultant Obstetrician with lead responsibility for the labour ward	Provides expert clinical input and clinical leadership. Will undertake on call sessions for the labour ward and provide advice and assist during emergencies. Key senior member of the multi-disciplinary team involved in caring for the critically ill obstetric patient (Lewis, 2007; Lewis, 2004).
Consultant Obstetrician and Gynaecologist who undertakes clinical sessions on the labour ward / on calls (excluding the Consultant Obstetrician with lead responsibility for the labour ward)	Provides senior clinical expertise. Will undertake on call sessions for the labour ward and provide advice and assist during emergencies. Key senior member of the multi-disciplinary team involved in caring for the critically ill obstetric patient (CMACE, 2011; Lewis, 2007).
Specialty Registrar in Obstetrics and Gynaecology - Specialty Training (ST) 3 and above, with allocated labour ward sessions and / or labour ward on calls (or equivalent title)	Key members of the multidisciplinary team who provide 24 hour obstetric cover on the labour ward (previous title Specialist Registrar)
Staff Grade Doctor (or equivalent title) working in the field of Obstetrics and Gynaecology undertaking labour ward sessions or maternity unit 'on calls'	Key member of the labour ward team providing clinical expertise.
Consultant Anaesthetist with responsibility for Obstetric Anaesthesia	Provides expert clinical input and clinical leadership. Key member of the multi-disciplinary team involved in caring for the critically ill obstetric patient (CMACE, 2011; Lewis 2007).
Specialty Registrar in Anaesthetics with allocated sessions on the labour ward and / or labour ward on calls (or equivalent post)	Key member of the multi-disciplinary team involved in the provision of obstetric anaesthesia and caring for the critically ill obstetric patient (CMACE, 2011; Lewis, 2007).
Staff Grade Doctor (or equivalent title) working in the speciality of Anaesthesia undertaking labour ward sessions or 'on calls'.	Key member of the labour ward team providing clinical expertise.

Table 3-2 Professional titles of the 'experts' involved in the provision of MHDC and rationale for inclusion in the survey.

3.3.3.1 Sample size

Fourteen professional titles comprised the multi-disciplinary team of obstetricians, anaesthetists and midwives who made up the expert group. It was decided that for each of the 7 OUs, 1 expert (or 2 where possible) from each of the 14 professional titles was approached to participate in the research giving a maximum sample size of 154. The accepted sample size for a Delphi survey has been debated, with sample sizes ranging from approximately 15 (Bramwell & Hykawy, 1999) to multiples of a hundred (Scapolo & Miles, 2006). The maximum sample size of 154 was determined on the basis of previous Delphi studies (Scapolo & Miles, 2006) and the acknowledgement that not all of the expert titles in Table 3-2 could be represented by large numbers of staff. However, it has also been suggested that where there is heterogeneity in the characteristics of the experts, as in this survey, larger numbers are required (Skulmoski, Hartman & Krahn, 2007).

3.3.3.2 Recruitment and sampling procedures

The researcher arranged meetings with each OUs Head of Midwifery and Clinical Director responsible for obstetrics to discuss the survey, answer questions and to obtain lists of names of all staff members who met each of the expert titles stated in Table 3-2. For some expert titles, large numbers of names were provided (e.g. for the Band 6 midwives title), whereas for some titles (e.g. Midwifery Risk Manager), only 1 name was supplied, reflecting a more specialist role within the team.

Where more than 2 names were provided for staff with certain expert titles (e.g. Band 6 midwives), a random sampling procedure was used to determine which 2 professionals would be approached to participate in the survey. This procedure ensured that all 'potential' participants had an equal chance of being selected, thereby reducing researcher bias (Polit & Hungler, 1995). This procedure involved putting all of the

names into a Microsoft Excel (2007) spreadsheet. Each name was allocated a number e.g. 1-30 if 30 names had been provided; these numbers equated with the 'input range'. Using the data analysis 'toolpak' in Microsoft Excel, the data analysis / sampling option was selected and the entire data set was selected. The random sampling option was subsequently chosen and the sample size ($n=2$) specified. The 2 numbers randomly generated using this method represented the names of the 2 professionals who were subsequently approached to participate in the survey.

3.3.3.3 Anonymity of participants

A positive aspect of the Delphi method is that it removes the problem of dominant and outspoken group members controlling discussions (Brown, 1968; Dalkey & Rourke, 1971). Consequently, the chance of reaching a specious consensus is reduced and the likelihood of individuals being reluctant to express their opinions publically can be eliminated (Brown, 1968). The hierarchical structures that have the potential to exist within the healthcare arena are removed when a Delphi survey is undertaken (Aylott, 2001; Williams & Webb, 1994). However, where groups of 'experts' work together they are likely to know each other and may discuss their involvement in a Delphi survey with other colleagues who are also participating. Where there is the potential for informal discussions and comparison of questionnaire responses, the term 'quasi-anonymity' is used (Raunch, 1979 cited by McKenna, 1994). Whilst participants can be asked not to discuss their answers with colleagues, in reality the researcher may have little control over the informal processes that occur, an acknowledged limitation.

3.3.4 Pilot study

Piloting the questionnaires prior to each round ensured that any issues including question wording, layout and completion times were identified and rectified (Bryman, 2012). The professionals who agreed to take part in the pilot study comprised of; one

Band six and one Band seven midwife, a supervisor of midwives, a deputy head of midwifery, a midwifery lecturer, a speciality registrar in obstetrics and gynaecology, a consultant anaesthetist, and a consultant obstetrician. These professionals worked in two of the OUs involved in the main study, apart from the midwifery lecturer.

The professionals reviewed and provided feedback on the 'letter of invitation to participants', the 'participant information sheet' and round one questionnaire (Hung, Altschuld & Lee, 2008). This process was repeated for rounds two and three of the survey. Of the eight health professionals who agreed to participate in the piloting process, seven returned feedback to the researcher.

Minor 'wording' changes were required for the round one questionnaire and biographical data sheets. One pilot respondent stated some of the round two questions were very vague and questioned some of the wording and content. This unearthed a dilemma for the researcher, as the second round questionnaire had been developed using the respondents' own words and phrases as far as practicable and, was intended to stay true to their first round data (Sackman, 1975). Nonetheless, question clarity influences the reliability of a questionnaire (Hung, Altschuld & Lee, 2008). This problem has been identified by other researchers and it was decided after careful consideration to impose minimal analytical closure at the second round stage but to adopt a more reductionist approach during the third round if required (Green et al., 1999).

3.3.5 Data collection and analyses

There are differing opinions as to the number of rounds that should be conducted in Delphi surveys ranging from 2 to 5 rounds (Mullen, 2000). It was decided to conduct a 3 round survey as described in previous Delphi studies (Endacott, Clifford & Tripp, 1999; Green *et al.*, 1999; Williams & Webb, 1994).

3.3.5.1 Round one data collection.

The Delphi survey provided a convenient means of gaining data, because the participants worked in OUs that were widely dispersed geographically (Adler & Ziglio, 1996). The round one Delphi postal questionnaire included a biographical data sheet, contact details slip and stamped return envelope (Edwards et al., 2002) (Appendix 3a). Where an expert did not return his / her completed questionnaire within two weeks or declined to participate, another expert with the same professional title was (where possible) randomly selected (using the procedure stated in section 3.3.3.2) and asked to participate in the survey (Hung, Altschuld & Lee, 2008). This procedure was undertaken once only, and was used to assist in enhancing return rates during the first round (Asch, Jedrzejewski & Christakis, 1997).

The round one questionnaire consisted of the open-ended question;

‘What constitutes high dependency care in the maternity unit setting?’

The participants were given instructions that included answering the research question as comprehensively as possible. They were informed they could use single words, phrases, statements, and paragraphs and were asked to include all aspects of MHDC that they felt to be relevant. The participants were also given examples of broad topics that could be included e.g. equipment, clinical indications and education (Denscombe, 2007).

3.3.5.2 Delphi Round one data analyses

The information obtained from the biographical data sheets were entered into the statistical analysis package SPSS version 17.0 (SPSS Inc., Released 2008) and descriptive statistics (percentages and means) used to summarise the participants’ biographical characteristics.

The qualitative data analyses were underpinned by a generic approach (Caelli, Ray & Mill, 2003; Cooper & Endacott, 2007; Sandelowski, 2000). Generic qualitative research is defined by Caelli, Ray & Mill (2003, p. 4) as “that which is not guided by an explicit or established set of philosophic assumptions in the form of one of the known qualitative methodologies”. A generic approach was chosen as it is important in Delphi surveys to ensure that the qualitative first round findings remain true to the respondents’ initial thoughts and opinions, with low levels of abstraction, so that respondents are able to easily recognise their first round data in the second round questionnaire (Keeney, Hasson & McKenna, 2011).

The precise analytical method chosen was qualitative description (Graneheim & Lundman, 2004; Neergaard et al., 2009). Qualitative description is a systematic process used to produce a “rich, straight description” of an issue with a low level of conceptualisation (Neergaard *et al.* 2009 p.2). The processes used to analyse the data are described below and were based on those described by Neergaard *et al.* (2009):

1. The data from the questionnaires were transcribed verbatim and checked for accuracy by the researcher (Miles & Huberman, 1994).
2. The transcripts were read in what has been termed an “interactive way” through the asking of questions that arise from the data (Dey, 1993, p.83) so that the researcher was familiar with and fully immersed in the data.
3. Codes were applied to segments of the data. In the context of qualitative description codes are defined as labels that are applied to segments of the raw data that identify similar phrases, words or features that describe the data and have a low level of abstraction (Miles & Huberman, 1994; Neergaard *et al.*, 2009). Codes were revisited and revised during the process of data analyses to ensure they accurately reflected the raw data (Miles & Huberman, 1994).

4. Codes that shared commonalities were clustered together to form subcategories and categories (Miles & Huberman, 1994; Neergaard *et al.*, 2009). The researcher constantly reread the data, looking for new categories or revising existing ones / modifying them, and exploring associations between them (Dey, 1993; Thomas, 2006).
5. The categories were finally grouped into four overarching themes. Themes link together a group of categories that share the same overarching essence (Neergaard *et al.*, 2009).

The researcher kept a data analyses diary to describe and explain the formation of new categories / subcategories and to provide a decision making trail to enhance procedural auditability and research trustworthiness (Rees, 1997). The supervisory team reviewed the analysed data at regular intervals, as peer review, alternatively termed peer debriefing, is a means of enhancing the rigour of qualitative data analyses (Creswell, 2003; Teddlie & Tashakkori, 2009). No major revisions to the subcategories or categories were required, thus suggesting the presence of interpretive reliability (Burns & Grove, 2003). As round one findings are relayed back to the respondents in subsequent rounds, this may be seen as a form of member checking, thereby enhancing the credibility of the findings (Keeney, Hasson & McKenna, 2011).

An example of the codes applied to the raw data and the subcategories and categories that developed through the clustering of the codes is shown in Table 3-3. Collectively, these codes and categories comprised the overarching theme of interventions, reported in section 4.5.

Theme	Category	Subcategories (where applicable)	Codes
Interventions	Post operative care		Post caesarean section care – first hour Prolonged post operative care
	Step down care		Transfer from ITU to Labour Ward Transfer from CCU to Labour Ward
	Care planning		Structured care plan Regular update / review of care plan Frequent treatment episodes
	Multidisciplinary referral and transfer	<ul style="list-style-type: none"> Medical staff (excluding intensivists) Critical care team and outreach service input Paramedical involvement Nursing input (excluding critical care nurses) Patient transfer to a specialist area 	Physicians Radiologist Haematologist. Biochemist Cardiologist Intensivists Critical Care Nurse involvement Critical Care Outreach team Physiotherapist involvement Operating Department Practitioner Theatre nurse Anaesthetic nurse Willingness to transfer to ICU Willingness to transfer to CCU
	Treatments	<ul style="list-style-type: none"> Administration of medication and fluids Regional pain relief Complex treatments (excluding medications and fluids) General maternity care 	IV anticonvulsants IV antihypertensives IV fluids / blood products Tocolytics IV Insulin IV Oxygen < 50% by face mask Epidural – intrapartum pain relief Epidural – post natal pain relief Inotropes / vasopressors Drugs / fluids via a central line Oxygen therapy > 50% by face mask Non-invasive ventilation (CPAP / BIPAP) Intubation / ventilation Renal support Pressure area care Postnatal care Thromboprophylaxis Neonatal care Pregnancy monitoring Support for family Psychological support for the woman
	Intervention level; Description of MHDC	<ul style="list-style-type: none"> Subjective Objective 	Care outside normal routine maternity care Interim level of care Specialist care that is not ICU Same care as intensive care Level one care Level two care Level three care

Table 3-3 The codes, categories and subcategories comprising the interventions theme

3.3.5.3 Delphi survey round two data collection

The round two questionnaires (Appendix 4) asked respondents to rate their level of agreement or disagreement with 106 statements, using five point Likert items. The term 'Likert type item' is used in preference to 'Likert scale', as Likert type items describe the individual statements that have Likert response alternatives, but the items are not summated in order to measure a single construct (Boone & Boone, 2012; Classon & Dormody, 1994). The original Likert 'scale' designed by Likert in 1932, consisted of Likert type 'items' that were summated in order to measure individuals' attitudes (Boone & Boone, 2012; Classon & Dormody, 1994). The original scale had five alternative responses (strongly approve, approve, undecided, disapprove and strongly disapprove for each 'item' (Classon & Dormody, 1994). Five point Likert items were chosen to assess the respondents' level of agreement or disagreement with each of the statements generated from the first round.

Round 2 questionnaire development

The statements comprising the round two questionnaire were developed using all of the codes that had been formulated during the first survey round (Keeney, Hasson & McKenna, 2011) and represented the themes of conditions, vigilance and interventions. The codes comprising the fourth theme of service delivery were *not* included in the second round questionnaire. It was decided by the supervisory team that as the respondents' data suggested there may be significant variations between OUs in terms of the way that local maternity service provision is organised and implemented, this theme would be analysed in a second research phase. It was considered inappropriate to seek a consensus on factors such as the environment where MHDC was provided during the second and third survey rounds of the Delphi as these factors were largely beyond the control of staff working in the individual OUs.

The round two statements examining the other first round themes (n=3), were formed from the corresponding codes. A high proportion of statements reflected the codes verbatim. Examples of medications, staff groups etc. were also taken verbatim from the raw data to clarify statements where required. A total of 106 statements were developed which, is in keeping with other Delphi surveys (Hung, Altschuld & Lee, 2008).

The researcher did not take a view as to which codes were more or less relevant when formulating the statements. Every code generated a statement and the researcher did not add or remove any statements. It was important for the second round questionnaire to accurately reflect the respondents' first round opinions and not those of the researcher (Keeney, Hasson & McKenna, 2011). The 'defining of questionnaire content' by the respondents themselves, is viewed as a factor that enhances the internal validity of Delphi studies (Endacott, Clifford & Tripp, 1999; Rowe & Wright, 1999).

The instructions the respondents were given in order to complete each section of the questionnaire also reflected the terminology they themselves had used during the first survey round. For example, section 10 of the second round questionnaire asked respondents to rate how strongly they agreed or disagreed that a list of interventions were components of MHDC because 'component' had been mentioned several times in the first survey round.

The respondents were given the opportunity to provide additional qualitative comments throughout the second round questionnaire, to enable them to justify, elaborate or clarify their answers. A final question determining the respondents' familiarity with the Intensive Care Society's (2009) 'Levels of critical care for adult patients' classification

system was also included. This question was included as a small proportion of the respondents had referred to this classification system on the first round questionnaire.

The questionnaire was piloted in order to test for item clarity, an important aspect in promoting instrument reliability (Mitchell, 1991). Piloting also tested whether the pilot responders utilised all five points on the Likert type items (their response frequency) (Moseley & Mead, 2000). It has been argued that if respondents consistently use only two points on a five point scale, the scale is effectively being used as a three point scale and may require redesign (Moseley & Mead, 2000). The feedback from the pilot survey identified that all five points on the Likert type items were used. Alterations to the questionnaire were made where necessary (grammatical issues and layout issues were addressed), and it was distributed to the eighty-five participants who returned the round one questionnaire. A reminder pack was posted to the non-responders after a period of approximately two weeks (Edwards *et al.*, 2002).

3.3.5.4 Delphi survey round two data analyses

The round two quantitative data were entered into SPSS 17.0 (SPSS Inc., Released 2008) and each statement was analysed individually using descriptive statistics. The Likert item responses were classified as generating ordinal data as although the Likert items had a rank order, it could not be presumed the respondents would view the distances between the item points as equidistant (Classon & Dormody, 1994; Jamieson, 2004). Consequently, the median scores and interquartile ranges were calculated for each statement (1 = strongly disagree (SD), 2 = disagree (D), 3 = neither agree nor disagree (NAND), 4 = agree (A) and 5 = strongly agree (SA)).

Calculating the mean as the measure of central tendency would, in this instance have been inappropriate, given the ordinal nature of the data and because the numbers

represented discrete textual statements (Jamieson, 2004). The median scores were calculated and used to inform the process of reducing the number of statements to be included in the third round whilst providing a broad overview of the data. The combined percentage of strongly agree (SA) and agree (A) scores and percentage of strongly disagree (SD) and disagree (D) were also calculated for every statement.

The respondents' data were grouped and analysed in the following sequence;

1. Across all seven OUs combined
2. By OUs with similar annual birth rates (group one, A and B; group two C and D; group three; E, F and G)
3. By professional title (doctor / midwife) working in OUs with similar annual birth rates.

A rationale for these analyses (and repeated during the third round) are presented in Table 3-4.

Respondents' data grouped by:	Rationale
All seven OUs combined (respondent group)	To obtain a professional consensus from those key professionals who provide MHDC
By OUs with similar annual birth rates (group one, A and B; group two C and D; group three; E, F and G)	To ascertain if professionals who work in OUs with similar annual birth rates share the same opinions regarding the concept of MHDC. The literature suggests there may be variations in service provision across OUs with differing annual birth rates (e.g. see Cordingley & Rubin, 1997) and such differences have the potential to influence local definitions for MHDC.
By professional title (doctor / midwife) working in OUs with similar annual birth rates.	To ascertain if doctors and midwives share the same opinions regarding the definition and defining features of MHDC when working in similar size OUs. This aspect of service provision has not been researched previously but there is a strong focus in the literature suggesting midwives may not be equipped to provide this type of care which, may have an impact on their definition of MHDC.

Table 3-4 Rationale for grouping of data during second round analyses

Inferential statistics were used to assess if differences in the frequency of responses given by respondents working in OUs with similar annual birth rates were statistically

significant. The Freeman-Halton extension of the Fisher's Exact test was used to calculate the probability (two tailed) using a 2x3 contingency table (Soper, 2015). The responses were collapsed into the nominal groups of 'agree' (combination of SA/A responses) and disagree (combination of SD/D and NAND responses). This test was used instead of the Chi square test because the numbers were relatively small and occasionally the expected frequencies in some cells were < 5 (Harris & Taylor, 2008; Peat & Barton, 2005). Furthermore, it is suggested that Fisher's Exact Test may be appropriately used for sample sizes up to 1000 (McDonald, 2014). The level of significance was set at $p < 0.05$ (Peat & Barton, 2005).

3.3.5.5 Level of consensus

'Consensus' has been defined in many different ways and this has provoked negative criticism of the Delphi method with the concept of consensus being likened to a "moveable feast" (Sackman, 1975; Williams & Webb, 1994). Predetermined median scores and interquartile ranges have been used to determine consensus whilst other researchers have set a percentage level of agreement (Keeney, Hasson & McKenna, 2011). Consensus has been set at 51% agreement (Loughlin & Moore, 1979), 80% agreement (Green *et al.*, 1999) and up to 100% agreement (Williams & Webb, 1994) with many variants in between (Goodman, 1987; Hasson, Keeney & McKenna, 2000; Mead & Moseley, 2000). There are no definitive rules as to how the level of consensus is set and it falls to the researcher to validate their choice. Whilst many researchers set the level of consensus for a Delphi survey a priori, some allow the level of consensus to be set by the research participants themselves (Aylott, 2001).

Although the majority of Delphi studies are undertaken with a focus on obtaining consensus on a particular issue, they may also be used to examine and / or gain insight into situations where differing opinions and disagreements occur (Turoff, 1970). Whilst this view seems to contradict the central tenet of the Delphi survey, which is to

gain a consensus, it can also contribute to the understanding of complex issues such as MHDC.

The level of consensus for the combined percentages of SA/A or SD/D statements was set at $\geq 80\%$, from the outset of the survey. The research team chose this level of consensus as it had been used successfully in other studies (Deane et al., 2003; Green *et al.*, 1999; Raine, 2006). Furthermore, it was necessary to make a pragmatic decision and set a level of consensus that would be realistically attainable when seeking the opinions of different professional groups working in different OUs, whilst being of significance to be 'credible' in clinical practice. Two of the pilot respondents were asked their opinions regarding the level of consensus that should be set. They agreed that given the complex nature of clinical practice, an 80% consensus of combined SA/A or SD/D statements was applicable.

3.3.5.6 Controlled feedback

Feedback to the participants, often in statistical form, after each successive round is a characteristic of traditional Delphi studies (Adler & Ziglio, 1996; Keeney, Hasson & McKenna, 2011; Mead & Moseley, 2000). However, modified approaches have been conducted whereby the methods first described by Linstone and Turoff (1975) are not followed precisely.

The researcher chose to undertake a modified Delphi survey, whereby the statistical results were not fed back to the respondents after the second round but alternatively, respondents were given the opportunity to provide written comments during the second and third rounds. The inclusion of qualitative data in a Delphi survey is not a 'new' concept and has been argued to be well suited for "research in the humanities and the social sciences" (Strauss & Zeigler, 1975, p.188). The second round qualitative

comments were fed back to the respondents indirectly, as these contributed directly to the development of the round three questionnaire. This strategy was implemented:

1. To offset a criticism that respondents are unable to discuss or clarify their opinions during Delphi surveys (Sackman, 1975) and reduce the chance of the respondents forming a 'specious or manipulated' consensus (Keeney, Hasson & McKenna, 2011; Sackman, 1975; Yousef, 2007).
2. To enable the use of a reductionist approach in the design of the third round questionnaire (Greene *et al.*, 1999). This involved some of the round two statements being combined / reworded for inclusion in the third round questionnaire. Consequently, it would have been potentially confusing for the respondents if all of the median and interquartile ranges been relayed for the second round statements. It would have also made the round three questionnaire unwieldy.
3. To reduce the respondents' likelihood of response fatigue. This may have been increased because of the additional information requiring assimilation, had all of the second round the statistical results been fed back to them (Choi & Pak, 2005).

3.3.5.7 Development of the third round questionnaire

The round three questionnaire (Appendix 5) derived from the round 2 results. It was decided to adopt a reductionist approach (Green *et al.*, 1999) to develop this questionnaire and reduce the number of statements sent back to the respondents during the third round. The round 2 statements with median scores of 4 and a level of consensus of 80% or more were removed from the round 3 questionnaire, unless comments provided by the respondents suggested further exploration in the final round was necessary.

Those statements with median scores of 1 (strongly disagree), 2 (disagree) and 5 (strongly agree) were also excluded from the round three questionnaire, unless comments provided by the respondents indicated the need for further exploration or rewording in the third round of the survey. The rationale for excluding questions / rewording them based on the median scores and frequencies specified above were:

1. Large numbers of statements in round three had the potential to impair the ability of the respondents to answer the questions carefully / reduce return rates (Choi & Pak, 2005). Removal of some statements reduced the number of statements from 106 in the second round to 47 in the third.
2. The screening and removal of certain questions by the research team allowed respondents to concentrate on important aspects (in this context, questions where consensus was not achieved, or were borderline, or where questions had been reworded in response to the respondents' second round comments) (Martino, 1993).

The first part of the round three questionnaire asked respondents to decide whether a list of conditions and interventions (n= 15) warranted intensive care as opposed to MHDC. These questions arose as a small proportion of respondents had specified that intensive care was required for some statements (1a–1d, 1f, 4d, 5a-5d, 8e, 8f, 8i-8k, 10o, 10s -10u, 10x-z) presented in the second round.

The second part of the questionnaire asked participants to rate their level of agreement or disagreement for a series of statements (n=32) relating to MHDC, using Likert type items. These statements had taken into consideration and incorporated the round two qualitative comments provided by the respondents. A full summary of all the second

round statements that were removed / combined / reworded to develop the third round questionnaire may be reviewed in Appendix 6 (Table A6-1). An excerpt of Table A6-1 is shown below in Table 3-5 below.

Question number		Median score (IQR)	SA/A %	Inclusion in Delphi Round 3 (Yes or No) with a brief rationale
10a	Step down care post ICU/CCU	4 (1)	93.3	Yes – can it be an indication?
10b	Immediate post operative care	3 (2)	47.3	Yes (median 3)
10c	Routine post op care up to 24 hours post LSCS	2 (1)	10.8	No (median 2)
10d	Prolonged post operative care > 24 hours	4 (1)	71.6	Yes – reworded as an indication for MHDC in response to respondent comments during round two
10e	Structured and regularly updated care plan	4 (1)	58.1	No – vague / 'applies to all aspects of care'
10f	Frequent treatment episodes	4 (1)	73.0	No – vague
10g	Referral to specialist medical staff	4 (0)	75.7	Yes – merged with 10j (reworded to say as required in response to qualitative comments)
10h	Referral to paramedical staff	3 (2)	41.9	Yes - merged with 10i
10i	Referral to nurses (excluding critical care nurses)	3 (2)	40.5	Yes, merged with 10h
10j	Involvement of critical care outreach team or ITU	4 (1)	90.6	Yes – merged with 10g (reworded to say 'as required' in response to qualitative comments)
10s	Drugs / fluids via central line	5 (1)	87.8	Yes (ICU required?)
10t	Oxygen therapy >50% by face mask	4 (2)	72.9	Yes (ICU required?)
10u	Oxygen therapy <50% by face mask	4 (1)	62.2	Yes (ICU required?)
10v	Epidural anaesthesia for pain relief in labour	2 (2)	29.7	No (median 2)
10w	Epidural analgesia excluding labour	3 (2)	29.7	Yes (median 3)
10x	Non invasive ventilation	4 (1)	78.4	Yes (ICU required?)
10y	Intubation and ventilation	5 (1)	78.4	Yes (ICU required?)
10z	Renal support	5 (1)	80.5	Yes (ICU required?)
10zi	Routine postnatal care	2 (3)	24.3	No (median 2)

Table 3-5 Excerpt from Table A6-1 showing rationale for round 2 statements included / excluded from round 3 questionnaire

Prior to distribution, the third round questionnaire was piloted. There was significantly less criticism about statements being vague when compared with the second round pilot feedback. Only minor alterations in terms of grammar and layout were required in this instance.

3.3.5.8 Round three data analyses

The round three quantitative data were entered into SPSS 17.0 and analysed using descriptive statistics. Part one of the questionnaire calculated the percentage of 'yes' and 'no' responses provided by the respondents. Part two of the questionnaire involved calculating the frequency of SA/A and SD/D statements. To assess if differences in the frequency of responses given by respondents working in OUs with similar annual birth

rates were statistically significant Fisher's exact test was used again. The qualitative comments were tabulated. During round three, the level of consensus for the yes / no responses and the combined percentages of SA/A statements remained at $\geq 80\%$ (Green *et al.*, 1999; Raine, 2006). The data were grouped and analysed as for the second round.

3.3.5.9 Timescales

The aim was to complete each survey round within three months to minimise respondent attrition and "weariness" (Scapolo & Miles, 2006, p.690).

3.4 Study phase two (Focus Groups)

The second study phase sought to examine the local factors that influence a midwife's decision to either provide MHDC or request the escalation of care. The theme of 'service delivery' had been identified during the Delphi survey (section 4.6) and first round comments from the respondents suggested there were variations between OUs in terms of the way that MHDC is organised and / or provided. This was influenced by local service delivery which, supports research and expert opinion (Cordingley and Rubin, 1997; Wheatly, 2010). Furthermore, the findings of the Delphi survey suggested midwives working in the smaller OUs may be more proactive, under certain clinical circumstances, to escalate the care of acutely ill women to ICU in preference to providing MHDC as reported in section 6.4.1.

Therefore, the second study phase was designed to identify the factors (at a local level) that influence a midwife to either provide MHDC or request EoC away from the OU; by clarifying / elaborating on how service delivery (research objective 1) and / or other features associated with MHDC (e.g. patient specific factors, professional issues,

clinical guidelines) (research objectives 2, 3 & 4) influence their decisions, when working in a range of OUs.

Short video vignettes were used to trigger focus group discussions designed to explore the factors that influence midwives' decision to escalate care. An explanation as to why video vignettes were chosen is provided in section 3.4.2. The focus groups were undertaken with midwives working in 3 OUs with differing annual birth rates and facilities. Prior to each focus group discussion midwives were also asked to complete

- i) a short biographical data sheet before the focus groups started and
- ii) a brief individual questionnaire prior to each focus group discussion commencing (Appendix 7).

3.4.1 Sample selection and recruitment

The research was conducted across 3 OUs in the South West of England that were geographically remote from the nearest tertiary referral centre. These OUs were purposively chosen for their differing annual birth rates, levels of neonatal care facilities and number of designated MHDC beds (Table 3-6) to facilitate the exploration of issues related to local service provision and their influence on midwives' EoC decisions.

Obstetric Unit	Type of Unit	Approximate number of births per annum	Neonatal care facilities	Number of delivery beds	Number of MHDC Beds	Situation of ICU relative to the OU
H	Obstetric Unit including midwifery led care.	1700	Special Care Unit (SCU)	5	0	Onsite, but in a separate building to that of the OU with no direct links between the two
I	Obstetric Unit including midwifery led care.	4300	Local Neonatal Unit (LNU)	9	No specific number of rooms – High dependency equipment taken to the patient's bedside	Direct link from OU to ICU via a number of very long corridors
J	Obstetric unit including midwifery led care.	5000+	Neonatal Intensive Care (NICU)	10	1	Same building next door to OU

Table 3-6 An overview of the OUs involved in the Focus Group research.

Two focus groups were conducted in each OU. One focus group involved Band 6 midwives, and one involved Band 7 midwives. The two Bands of midwives were separated, as it was felt there was potential for the Band 6 midwives to feel inhibited by their Band 7 colleagues (Kitzinger, 1995) and they have differing roles. Band 6 midwives provide clinical care on a daily basis whilst Band 7 midwives, often termed coordinators, have a managerial role and oversee all labour ward activities. They provide advice and assistance to other midwives and staff on the labour ward and often have managerial responsibility for a team of Band 6 midwives. Midwives were purposively sampled from each of the 3 OUs to ensure they represented the clinical grades required for the study and had recently worked (in the last 3 months) or were currently working on the labour ward.

Names of potential participants were obtained from the relevant Heads of Midwifery / Matrons and the midwives were contacted by letter and asked if they wished to participate in the study (Appendix 9b). The midwives were also sent an Information Sheet and asked to sign a consent form (Appendix 9b). A record of the midwives agreeing or declining to participate was recorded by the researcher and when data collection was completed on that site the sheet was destroyed.

3.4.2 The development of video vignettes as triggers for the focus group discussions

Three simulated clinical scenarios using video vignettes were used to act as the triggers for the focus group discussions. The video vignettes were accompanied by written objective information (Appendix 8a). Vignettes can include “text, images or other forms of stimuli to which research participants are asked to respond” (Hughes & Huby, 2002, p.382). Video vignettes were chosen as opposed to written scenarios, as

these encourage participants to “draw their own meaning from observations to a greater extent than written vignettes” (Hughes & Huby, 2004, p.38).

The researcher initially considered undertaking an ethnographic study to examine the factors that influence midwives’ decisions to escalate care in the labour ward setting, an approach that has been utilised previously with success (Mackintosh *et al.*, 2014; National Patient Safety Agency, 2007). However, it was felt that observing the care of women who were acutely unwell or, who were experiencing obstetric complications on the labour ward would be inappropriate and unethical.

Moreover, because the researcher worked full time it would have been problematic for her to be available when important care escalation decisions were being made on the three study sites that were geographically distant from her workplace. Gould (1996) identifies that using vignettes to promote discussion about a research topic is appropriate where direct observational methods (such as an ethnographic study) may be problematic or ethically unsound.

Vignettes are designed to replicate real world situations and have three main functions. The simulation function “is a facet of construct validity or the degree to which a variable approximates or measures the intended theoretical construct” (Evans *et al.*, 2015, p.163). Secondly, the elicitation function² pertains to the study’s internal validity, and the final function is to generalise to situations in the real world and underpins a study’s external validity (Evans *et al.*, 2015). In this study the vignettes were designed to stimulate practice situations involving acutely ill women that the midwives might encounter, and to stimulate their discussions about the factors that influence their

² Elicitation effect – a vignette produces an effect ‘that is hypothesized to exist independently in the real world’ (Evans *et al.*, 2015, p, 163)

decisions to provide MHDC or request care be escalated away from the OU at a local level.

3.4.2.1 Development of the video vignettes

A number of measures were taken to ensure the scenarios were content valid and represented clinically plausible scenarios the midwives might reasonably be expected to encounter. The video vignettes were developed using an amalgamation of the following;

1. Published Research to inform Vignettes

Findings from the literature review suggests that hypertensive disorders of pregnancy and obstetric haemorrhage are commonly cited indications for MHDC and these conditions formed the basis for scenarios one and two (Kuukasjarvi & Waite, 2012; Rajagopal *et al.*, 2011). Moreover, pulmonary embolism is identified as a common cause of severe maternal morbidity (Health Improvement Scotland, 2014; Lawton *et al.*, 2014; Oliveira Neto *et al.*, 2009) and cardiac disorders are cited as a non-obstetric indication for MHDC and are the “largest single cause of indirect maternal deaths” in the UK with a rate of 2.06 / 100,000 maternities for the 2011 to 2013 triennium (Knight *et al.*, 2015 p.12).

2. Findings from the Delphi study identifying the defining features of MHDC including the round one categories and subcategories comprising the ‘service delivery’ theme (Table 4-5, section 4.6, p 155). These findings suggested there may be variations in local service delivery / other factors that influences midwives’ EoC decisions.

3. Case note audit of women who had received MHDC and / or were transferred to ICU. This was undertaken by the researcher and an experienced research midwife. The relevant permissions were obtained prior to the maternity risk manager identifying

suitable sets of case notes for auditing. Three sets of case notes were identified via the Trust's risk management clinical incident reporting system and included those that had triggered incident reporting in the categories of;

- Major haemorrhage
- Unexpected transfer to ICU / other specialist area
- Eclampsia

The three data sources were amalgamated in order to develop the video vignettes. Clinical trends (e.g. in the form of haematology / biochemistry results and fluid balance), were anonymised by changing dates, times and altering values very slightly, before being incorporated into the three clinical scenarios.

The written objective information accompanying each video vignette included a brief generic overview of staffing levels and labour ward workloads, MEOWS and fluid balance charts, excerpts of simulated midwifery documentation and blood results. Incorporation of the objective data made the scenarios as comprehensive and as clinically credible as possible, thereby enhancing the face and content validity (Matthews & Ross, 2010). Table 3-7 outlines the key features of each scenario. Scenarios one and two represented women classed as receiving level two care and scenario three, classed as a woman receiving level one care, with potential for physiological deterioration (Maternal Critical Care Working Group, 2011).

The scenarios were 'acted' by two final year student midwives and a University employee. The scenario storyboards were scripted by the researcher (Appendix 8a).

	Scenario one	Scenario two	Scenario three
	Postnatal woman with severe pre eclampsia at 30/40 gestation. Vaginal birth 90 minutes previously. Neonate on Neonatal Unit	Postnatal woman who has recently had a primary PPH. On-going management in progress after the initial emergency treatment Neonate with mother	Woman 32/40 pregnant with comorbidities (type II diabetes and Ventricular septal defect repaired in infancy) Raised BMI. Admitted with mild chest pain and low oxygen saturations (88-90%) in air.
Clinical picture	Magnesium sulphate / IV anti hypertensives in progress	Blood transfusion in progress	ECG continuous in progress
	Uncontrolled hypertension	CVP line in situ due to poor peripheral access	Requiring 4L/min oxygen via face mask to maintain oxygen saturations at 97%
	Hyper reflexic, 4 beats of clonus.	Hourly CVP readings requested by anaesthetist to guide fluid replacement	Stable vital signs whilst patient has oxygen therapy in progress
	Headache	Stable pulse and blood pressure. Lochia within normal limits	Normal CTG, normal fetal movements
	Blood picture shows HELLP syndrome	Reduced urine output	Differential diagnosis of cardiac event or PE
	Overall: presents with an unstable clinical picture in view of uncontrolled severe hypertension, blood picture and neurological examination.	Overall, relatively stable condition, but requiring CVP monitoring	Currently stable with oxygen therapy in progress but potential for deterioration.
Workload	Moderate. All women on the labour ward are in labour – mainly low risk.	High. All but one of the labour rooms are occupied however, anticipated that three women will be transferred home / to the post natal ward in the next 60 minutes.	Low - moderate. There are empty rooms, mainly low risk women in labour.
Staffing	Correct number and grades of midwives on duty for the maternity unit in question	All band 6 midwives with one band 7 midwife coordinating. One band 6 midwife off sick	All band 6 midwives (except one band 5 preceptee) on duty with one band 7 midwife coordinating. No staff off sick

Table 3-7 Main features of the three scenarios

3.4.2.2 Content validity of the video vignettes and supplementary data

A panel of clinicians assessed the content validity of the key features (items) of the three scenarios (Hughes and Huby, 2004). Firstly, an item content validity index (I-CVI) measure was developed and piloted with a Band 8 Labour Ward midwifery matron and a Midwifery lecturer experienced in high-risk intrapartum care. Piloting of the video vignettes and associated documentation occurred simultaneously. For each scenario, 9 statements were developed. Raters were asked to provide scores for each of the 9 statements. A 4 point Likert type scale was used (1 = not accurate, 2 = somewhat accurate, 3 = quite accurate, and 4 = highly accurate) (Wynd, Schmidt & Atkins Schaefer, 2003). Ratings of 1 or 2 represented 'content invalid' or 'not accurate'

responses and ratings of 3 or 4 were seen as 'content valid' or 'accurate' (Lynn, 1986). The I-CVI was calculated by summing the number of content valid responses (designated by an 'x' in tables 3-5 and 3-6) and dividing this score by the total number of raters (Lynn, 1986; Polit & Beck, 2006). The Content Validity Index Measure for the three scenarios is shown in Appendix 8b. The pilot I-CVI measure results are shown in Table 3-8.

Scenario 1 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1 Pilot	x	x	x	No	x	x	No	x	x
Rater 2 Pilot	x	x	x	No	x	x	No	x	x
I-CVI	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0
Scenario 2 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1 Pilot	x	x	No	x	x	x	x	x	x
Rater 2 Pilot	x	x	x	x	x	x	x	x	x
I-CVI	1.0	1.0	0.5	1.0	1.0	1.0	1.0	1.0	1.0
Scenario 3 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1 Pilot	x	x	x	x	x	x	x	x	x
Rater 2 Pilot	x	x	x	x	x	x	x	x	x
I-CVI	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 3-8 Results of the pilot I-CVI

After piloting of the CVI measure had taken place, rewording of items 4 and 7 (scenario 1) and item 3 (scenario 2) occurred in response to the comments provided by the pilot raters. The incorrect procedure for testing a patient's deep tendon reflex was also identified by both of the pilot raters in video vignette 1, and the video was subsequently edited to remove the incorrect procedure.

The Content Validity Index Measure was completed by 6 raters, none of whom were involved in the pilot. The raters included a midwifery lecturer, a Band 7 midwife and 5 Band 6 midwives who all worked on the labour ward of a large OU. The mean length of time the Band 6 midwives had been on the Nursing and Midwifery Council register was eight years. The Band 7 midwife had been registered as a midwife for 15 years and the midwifery lecturer for > 20 years.

I-CVIs should be no lower than 0.78 when there are 6 or more raters according to Lynn (1986). Three items had I-CVIs of 0.83 and these items were spread across the 3 scenarios. All of the other I-CVIs scored 1.0, suggesting the key items comprising the three scenarios were accurate (Table 3-9).

Scenario 1 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1	x	x	x	x	x	x	x	x	x
Rater 2	x	x	x	x	x	x	x	x	x
Rater 3	x	x	x	No	x	x	x	x	x
Rater 4	x	x	x	x	x	x	x	x	x
Rater 5	x	x	x	x	x	x	x	x	x
Rater 6	x	x	x	x	x	x	x	x	x
I-CVI	1.0	1.0	1.0	0.83	1.0	1.0	1.0	1.0	1.0
Scenario 2 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1	x	x	x	x	x	x	x	x	x
Rater 2	x	No	x	x	x	x	x	x	x
Rater 3	x	x	x	x	x	x	x	x	x
Rater 4	x	x	x	x	x	x	x	x	x
Rater 5	x	x	x	x	x	x	x	x	x
Rater 6	x	x	x	x	x	x	x	x	x
I-CVI	1.0	0.83	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Scenario 3 Items rated 3/4 (x)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Rater 1	x	x	x	x	x	x	x	x	x
Rater 2	x	x	x	x	x	x	x	x	x
Rater 3	x	x	x	x	x	x	x	x	x
Rater 4	No	x	x	x	x	x	x	x	x
Rater 5	x	x	x	x	x	x	x	x	x
Rater 6	x	x	x	x	x	x	x	x	x
I-CVI	0.83	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 3-9 Results of the I-CVI for the three clinical scenarios.

3.4.3 Data Collection using focus groups

The focus groups were conducted in seminar / meeting rooms within or in very close vicinity of the OUs, on Trust property. On 2 occasions, the focus groups were held in clinical rooms on the labour ward. The researcher moderated the focus groups and an assistant moderator (the researcher's PhD Supervisor) was present and took detailed notes throughout the focus groups (except on one occasion). Prior to the focus groups commencing the researcher thanked the participants for attending and reiterated the purpose of the research. The organisation of the focus groups and completion of the

individual questionnaires were explained to the participants in order to promote parity of data collection processes across the 3 OUs (Morgan, 1998). Refreshments were provided for the participants at the outset, as some midwives were attending during their meal breaks. The midwives' signed consent forms were collected at the outset and the researcher answered any questions the participants had.

The 3 video vignettes were shown to the participants using a portable projector after unanticipated difficulties accessing and utilising hospital computers / projectors were identified during the first focus group. After the participants had viewed the first video vignette, they were given the supplementary objective data and were asked to complete the relevant section of their individual questionnaires. The midwives were asked not to discuss their answers until the focus group had commenced. The focus group for each of the three video vignettes commenced when all the midwives had completed their individual data sheets and was digitally recorded.

3.4.3.1 Focus groups

Focus groups were chosen as the primary data collection method for the second study phase as they are a means of obtaining data arising from group interactions and, enables participants to discuss their opinions, attitudes and experiences regarding specific issues (Barbour & Kitzinger, 1999; Krueger & Casey, 2009; Powell & Single, 1996). Focus groups also enable participants to question each other's opinions and views and can stimulate debate which, individual interviews and questionnaires cannot (Krueger & Casey, 2009). Focus groups are useful when the knowledge regarding a topic is scant or existing information requires additional exploration, the subject is complex or quantitative findings require clarification (Morgan, 1998; Powell & Single, 1996). Focus groups afford insight into how participants maintain or change their

opinions within a group situation and have five key features according to Krueger and Casey (2009) as discussed below.

3.4.3.2 Focus group participants and their characteristics

Participants are chosen because they are able to relay information about experiences of interest to the researcher, in this case, information regarding MHDC provision and EoC (Morgan, 1998). The homogeneity of focus group participants will be controlled by the researcher and, it has been advocated that “the more homogenous a group is, the better they will relate to each other” (Greenbaum, 1998, p.62). However, other factors including pre-existing relationships between participants and the skill of the moderator will influence focus group dynamics and productivity in terms of the quality of the data generated (Krueger, 1998).

The number of participants comprising a focus group is open to debate with numbers ranging between 4 to 6 for what has been termed a mini-group, and up to a maximum of 12 participants (Greenbaum, 1998; Stewart, Shamdasani & Rook, 2007). Too many participants may make the group unmanageable for the moderator and too few may mean discussions are limited, although this will be dependent on the participants and the skill of the moderator (Freeman, 2006; Morgan, 1997). In this study the size of each focus group planned to be 6-8 midwives, to realistically reflect the maximum number of midwives that might be released from clinical duties at any one time.

Whilst some argue that focus group participants must be unknown to each other so they can share their thoughts and opinions without feeling inhibited or embarrassed (Powell & Single, 1996), others argue that participants may be known to each other, with the proviso there are clear ground rules outlining the need for group confidentiality (Matthews & Ross, 2010; Morgan, 1997). Where focus group participants are known to each other, there may be a propensity towards interactions that equate with “naturally

occurring data (such as might have been collected by participant observation)” (Kitzinger, 1995, p.300).

3.4.3.3 Collecting qualitative data through a focused discussion

The third characteristic of focus groups is the generation of rich qualitative data centring on the topic of interest, although the quality of the data collected will be influenced by the skill of the moderator, the level of interest the participants have regarding the topic under discussion and their motivation for taking part (Morgan, 1997). The data obtained will be dependent on the research objectives, the moderator, the moderator guide and the interest and engagement of the participants (Greenbaum, 1998).

The moderator is the person who orchestrates the fourth characteristic of focus groups, the focused discussion. The moderator must understand the study aims and objectives and have a sufficient knowledge of the topic under consideration (Krueger, 1998; Krueger & Casey, 2009). There is debate as to who the moderator should be, for example the principal researcher, a person known to the participants, or a professional moderator unknown to the organization or participants (Greenbaum, 1991; Krueger, 1998). Where sensitive topics are being considered, the age, gender, ethnic background, language of the moderator may also require careful consideration (Krueger & Casey, 2009; Morgan, 1998; Stewart, Shamdasani & Rook, 2007). The skills required by a successful moderator are less open to debate and include the ability to communicate clearly, actively listen, stimulate discussions, clarify information and make the participants feel valued and at ease (Grønkjær et al., 2011).

The first question posed to the midwives across the six focus groups was:

‘In terms of care escalation, how would you want to manage this situation and why?’

The moderator was interested in if / how service delivery / practice in the midwives' local workplaces influenced their EoC decision making. This approach was taken as the finding from the Delphi survey suggested that midwives in the smaller OUs were more likely to request women be transferred to intensive care than provide MHDC. The moderator used prompts such as;

- Are there any other factors you would consider?
- Why would you not do OR why would you do....?
- Are there any other aspects of this scenario you would be thinking about when considering your escalation of care decisions?
- Are there any other factors that might influence your decisions?

3.4.4 Data Analyses

The framework method is centred on a thematic analytical approach (Gale *et al.*, 2013). Inductive reasoning was employed through the process of open coding whereas deductive reasoning utilised codes that were developed a priori from the findings (categories and subcategories) of the Delphi survey. The data were analysed using the stages outlined below (Gale *et al.*, 2013; Pope, Ziebland & Mays, 2000; Srivastava & Thomson, 2009).

Stages one and two; familiarisation and transcription.

The completed individual questionnaires were transcribed by the researcher and entered into NVivo. NVivo is a software programme that enables the researcher to “organise, query and visualize the data” but does not analyse the data (Bazeley & Jackson, 2013, p.3). The individual questionnaires were grouped according to the Band of midwife, the OU and scenario number (e.g. Band 6, Unit J scenario 1/2/3) and each group was classed as a ‘case node’. An example of the transcribed individual questionnaires may be found in Appendix 11. The focus groups were also transcribed

verbatim and entered into NVivo. Three were transcribed by a University employee and the rest by the researcher. Each transcribed focus group was classed as an individual case node in NVivo to enable the researcher to analyse the data flexibly across a series of different framework matrices (e.g. by Band of midwife / Obstetric Unit / scenario number) (Bazeley & Jackson, 2013). The researcher checked all of the transcribed focus groups for accuracy and reread them in order to familiarise herself with the data.

Stage three: coding

Firstly, the data from 2 focus groups (Unit H, Band 6 midwives, scenario 1 and Unit I, Band 7 midwives, scenario 2) and two sets of 'individual data sheets' (Unit J, Band 6 midwives scenario 3 and Unit H Band 7, scenario 2) were open coded. A code is "a descriptive or conceptual label that is assigned to excerpts or raw data" (Gale *et al.*, 2013, p.2) and inductive 'open coding' was undertaken on a portion of the raw data, to enable the researcher to examine the data in a comprehensive manner and ensure that no significant topics or issues were overlooked (Gale *et al.*, 2013). 'A priori' codes, (codes developed during the first round of the Delphi survey) were applied to the data, once the initial open coding process on the subset of data was complete. The researcher was cautious to ensure that the application of these codes did not 'narrow' her view of the data and continued to search for and add new codes to the data (Bazeley & Jackson, 2013).

Coding was an iterative process; the researcher moved between the raw data and the codes, to ensure the codes were representative of the raw data and did not overlap. Where codes were very similar in meaning, they were merged together (Bazeley, 2013). Memos made by the researcher throughout the analytical process enabled her to capture thoughts and ideas, describe categories and subcategories, and explain

initial findings. An example of a coded focus group, using NVivo coding stripes to highlight the codes applied to the data is shown in Appendix 12.

Stage four; developing the analytical framework

As the number of codes increased, the researcher began organising the codes into categories and subcategories and these formed the basis of the framework matrix (Bazeley, 2013; Gale *et al.*, 2013). The analytical framework informed the subsequent data analyses.

Stage five; indexing the remaining raw data.

Once the framework matrix was complete, the outstanding focus group data and midwives' individual data were coded to the subcategories and categories developed during stage four. This process may be described as 'indexing' (Pope, Ziebland & Mays, 2000; Srivastava & Thomson, 2009) and the use of NVivo, enabled the researcher to organise the data in a systematic manner that enabled easy retrieval and tracking of the raw data back to the original sources. An excerpt from the framework matrix (not including excerpts from the raw data) is shown in Table 3-10 overleaf, to demonstrate how it was applied to the data (focus group data is denoted by FG and individual data by ID). The categories and subcategories comprising the framework matrix are presented in Appendix 13 (Table A13-0).

Category	CLINICAL COMPLEXITY				MOTHER / BABY CONSIDERATIONS		
Subcategories	Diagnosis	Stability / potential for deterioration Objective	Stability / potential for deterioration Subjective	Risk status	Fetal neonatal considerations	Mother baby separation	Maternal support
Source of Data (Case nodes in NVivo)							
Band 6 Unit H (FG)	<i>Excerpts from raw data inserted into each cell</i>	<i>Researcher memos also inserted into the cells</i>					
Band 6 Unit H (ID)							
Band 7 Unit H (FG)							
Band 7 Unit H (ID)							
Band 6 Unit I (FG)							
Band 6 Unit I (ID)							
Band 7 Unit I (FG)							
Band 7 Unit I (ID)							
Band 6 Unit J (FG)							
Band 6 Unit J (ID)							
Band 7 Unit J (FG)							
Band 7 Unit J (ID)							

Table 3-10 Excerpt of the framework matrix to show how it was applied to the data

Stages six and seven; charting and interpretation of the data

The sixth and seventh stages of the analytical process involved the charting and interpretation of the data. Analytical ‘summaries’ of each of the categories and subcategories were recorded in the framework matrix. The analytical summaries involved descriptions of the categories and subcategories and, identified links or ‘associations’ between categories. Verbatim ‘excerpts’ of the raw data were also included in the framework matrix. The completed framework matrix supported the formation of a schematic representation of the factors that influence a midwife’s decision to request care escalation (Srivastava & Thomson, 2009). A member of the Supervisory Team reviewed the data analyses periodically to discuss the analytical choices made.

3.5 Ethical considerations

3.5.1 Ethical approval

Respect for persons, beneficence and justice are key principles underpinning ethical research (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978). Ethical approval for the Delphi survey was granted by the Cornwall and Plymouth National Research Ethics Committee (REC reference: 08/H0203/12) and the Focus Group study by the Integrated Research Application System (IRAS) (IRAS Project number 129717). The 7 National Health Service (NHS) Research and Development Departments representing the NHS Trusts whose staff were involved in study phase one, and the two during study phase two were also approached and, the relevant local ethical approvals were sought and obtained. Ethical approvals were also obtained from the researcher's employer, the University of Plymouth.

3.5.2 Informed consent and right to withdraw

During both study phases, the participants received a participant information sheet and a covering letter (Appendix 9a-9b). Participants were informed that they would be able to contact the researcher for further information or clarification at any time throughout the study phases, which maintained the dynamic process of informed consent (Munhall, 1988).

All participants had the right to decline to participate in the studies and had the right to withdraw at any time until the point when their data had been anonymised and could no longer be identified as their data. Where participants agreed to be involved in study phase two, they were asked to sign a consent form (Appendix 9b) (Bryman, 2012). Midwives who did not wish to participate in the second study phase were reassured on

the participant information sheet that their employer would not be informed. The midwives were also informed they could contact the researcher or either of her supervisors following the research to discuss / debrief if required.

3.5.3 Maintaining confidentiality and anonymity

All study participants were identified by codes to ensure subject anonymity was preserved throughout the two study phases. No names were used on written records made by the researcher and the respondents were assured confidentiality. All paper and electronic data were stored securely, with non-electronic data being stored in a locked filing cabinet (Information Commissioner's Office, 2012). Electronic data were stored on a password protected university computer and will be stored for a period of ten years (after completion of the research), in line with regulations stipulated by the researcher's employer and in compliance with the Data Protection Act (Information Commissioner's Office, 2012).

3.6 Synopsis

This chapter has discussed the philosophical underpinnings and research methods of the first and second study phases. The first study phase utilised a modified 3 round Delphi survey to determine what constitutes MHDC in OUs remote from tertiary referral centres. Experts (obstetricians, anaesthetists and midwives) were accessed from 7 OUs with varying annual birth rates (1500-4500 per annum) to participate. The second phase used focus groups to examine the factors that influence a midwife to provide MHDC or request a woman's care be escalated away from the OU. The triggers for the focus group discussions were 3 video vignettes devised from the literature, findings of the Delphi survey and a review of clinical case notes. Chapters 4, 5 and 6 report the results of each Delphi survey round whilst chapter 7 presents the findings of the second (Focus Groups) phase.

Chapter 4 Results of Delphi Survey (Round One)

4.0 Introduction

Due to the large volumes of data generated, the results of each Delphi round are presented sequentially in chapters four, five and six. This chapter presents the round one results.

4.1 Round one response rates

In the 'first wave' n=140 questionnaires were distributed, 'second wave' n=53 and overall, a total of n=193 questionnaires were sent to the 7 OUs. In total, 85 round one questionnaires were returned during the first and second waves of questionnaire distribution, giving an overall round one response rate of 44% (Appendix 10, Table A10-1). All of the professional categories approached to participate in the survey were represented by the returns (Appendix 10, Table A10-2).

4.1.1 Biographical profiles of the respondents

The professionals' biographical details are shown in Table 4-1. None of the professionals had been registered with their requisite professional bodies for less than 5 years. Overall, 76.5% of the respondents (n=65) stated they had undertaken training, courses or study days that were relevant to MHDC provision. In contrast, n=20 (23.5%) stated they had not undertaken any training relevant to MHDC provision with the majority being midwives.

Professional group	Mean number of years registered (Standard deviation) (Range)	Mean number of years in current post (Standard deviation) (Range)
Obstetrician	16.9 (SD 5.9) (Min. 8 Max. 25)	6.7 (SD 3.1) (Min. 3 Max. 13)
Anaesthetist	19.5 (SD 9.2) (Min. 5 Max 35)	7.4 (SD 6.6) (Min. 4 Max. 20)
Midwife	19.5 (SD 6.5) (Min. 6 Max. 33)	8.3 (SD 5.4) (Min. 0.7 Max. 20)

Table 4-1 Respondents' average registration period and time in current post

The Advanced Life Support in Obstetrics (ALSO) course had been undertaken by n=12 respondents (14.1%), local Trust mandatory training relevant to MHDC n= 10 (11.8%) and n=6 (7.1%) had attended the ALERT course (7.1%). Overall, 39 courses / study days / in house events were listed by the respondents as being of relevance to MHDC provision (Appendix 10, Table A10-3).

Only 9% of midwives (n=4) had undertaken Higher Education Institution (HEI) degree or masters level modules in care of the critically ill adult / high dependency care. None of the midwives had undertaken any English National Board (ENB) educational course related to adult intensive care (ENB 100), paediatric intensive care (ENB 920) or neonatal intensive care (ENB 405).

All of the doctors (n=41) had studied at degree level or above, compared with 59% (n=26) of the midwives. Six of the doctors had studied at doctorate level compared with one midwife. Twelve doctors had Masters Degrees compared with three midwives. Fourteen of the midwives identified that their highest academic qualification was at Diploma level and five stated their highest qualification was achieved at certificate level.

4.2 Round one themes

Four overarching, interrelated themes emerged from the qualitative data. These were:

- Conditions
- Vigilance
- Interventions
- Service Delivery

4.3 Conditions identified as requiring MHDC

The conditions theme encompassed the categories of obstetric conditions, intrapartum care, comorbidities, complications, physiological instability and emotional and psychosocial complications (Table 4-2). Where qualitative data excerpts are included, the notation used is the anonymised OU code (A-G) and respondent number.

Comments in red type e.g. (section 1) alongside the category names in Tables 4-2 to 4-4 refer to the corresponding section of questions in the Round 2 Delphi Questionnaire.

Theme	Category	Subcategories
Conditions	Obstetric (section 1)*	<ul style="list-style-type: none"> • Hypertensive disorders (and related emergencies) • Haemorrhage • Amniotic fluid embolism • Other conditions (Obstetric cholestasis, gestational diabetes, acute fatty liver)
	Intrapartum care (section 2)*	<ul style="list-style-type: none"> • Low risk • High risk
	Pre existing conditions (comorbidities) (section 3)*	<ul style="list-style-type: none"> • General comments • Diabetes • Cardiac • Renal • Liver • Respiratory • Obesity • Autoimmune disorders • Organ transplantation • Disabilities • Central nervous system • Immobility • Haematological
	Complications (section 4)*	<ul style="list-style-type: none"> • Thromboembolic • Sepsis • Haematological • Surgical
	Physiological instability (section 5 & 7)*	<ul style="list-style-type: none"> • Physiological deterioration • Shock • Collapse • Organ dysfunction / failure • Clinical risk
	Emotional or psychosocial (section 6)*	

Table 4-2 Delphi survey round one, theme of conditions showing the categories and subcategories

4.3.1 Obstetric conditions

The respondents frequently identified obstetric conditions necessitating women to require MHDC. These included the subcategories of hypertensive disorders and haemorrhage;

“The main need [for MHDC] is for additional care of mothers with pre eclampsia and those who have had significant haemorrhage” (E10)

“Hypertension which is difficult to control, especially in association with abnormal LFT’s, signs or symptoms of fulminating PET / eclampsia” (B 29)

The two subcategories generated large volumes of data. Other obstetric conditions identified by the respondents included AFE, gestational diabetes, obstetric cholestasis and acute fatty liver of pregnancy.

4.3.2 Intrapartum care

Intrapartum care was subdivided into ‘low’ risk and ‘high’ risk care. Some respondents likened intrapartum care to high dependency care due to the ‘one to one’ care that women require during labour.

“Almost any woman in active labour has a short term high dependency on her midwife – 1:1 care in labour”. (E 81)

“Any other condition requiring 1:1 care such as labour and birth” (D 54)

The ‘high risk’ intrapartum subcategory described those women with complex labours who may require MHDC. Respondents gave examples of women requiring medications for the cessation of pre-term labour (e.g. Atosiban), those receiving intravenous syntocinon infusions, and epidural analgesia. Some respondents suggested that women with ‘fetal’ risk factors such as malpresentations and multiple pregnancies may require MHDC. It was necessary to clarify in round two whether these conditions influenced and dictated the need for the high dependency care, or whether the one to one care required by these women was the indicator.

“Care of women with prem labour on atosiban infusion. Women with epidurals and syntocinon infusions can be very time consuming, but maybe not classified as high dependency?” (A 29)

“High risk labours i.e. syntocinon, epidural, mec liquor” (D 50)

“...vaginal birth after caesarean section, malpresentation, multiple pregnancy...” (E 20)

4.3.3 Maternal Pre-existing conditions

The category of pre-existing conditions (co-morbidities) was large, consisting of thirteen subcategories. The first subcategory encompassed the generic identification of comorbidities as an indication for MHDC. The further 12 subcategories included a wide range of pre-existing conditions for which, MHDC may be indicated. The respondents frequently cited diabetes, cardiac disorders, respiratory, haematological renal and liver conditions. They also identified autoimmune disorders and central nervous system disorders as possible indications for MHDC. A smaller number of respondents suggested women with disabilities, mobility issues and obesity might also require MHDC.

“..pre existing diseases – cardiac, diabetes, some disabilities” (E 81)

4.3.4 Maternal Complications

Complications associated with the need for MHDC included thromboembolic events, sepsis, haematological problems, surgical events, disseminated intravascular coagulation (DIC) and sepsis. The respondents identified that women experiencing surgical complications might necessitate MHDC but many were non-specific in terms of the types of surgical complications that might be encountered.

4.3.5 Physiological instability and clinical risk

The physiological instability category included the subcategories of maternal physiological deterioration, shock (e.g. hypovolaemic, neurogenic, septic, anaphylactic), maternal collapse, organ dysfunction (e.g. cardiac or respiratory insufficiency, altered renal or liver function) and organ failure (e.g. acute renal failure) and a woman's level of clinical risk.

"Maternal collapse due to haemorrhage / infection / or other condition" (G 65)

"Organ dysfunction with immediate or ongoing threat to life or wellbeing of mother or fetus" (F 14)

"Evidence of cardiac / respiratory insufficiency" (E 3)

This category generated a large volume of data inferring that physiological instability was a key factor when considering the clinical indications for MHDC. Respondents described women as being at increased risk, very high risk, having potential for deterioration, experiencing potential / actual threat to maternal life, experiencing potential / actual threat to fetal life, being unwell / acutely sick, experiencing complications and being critically ill. They also described the potential impact women's risk factors might have on their wellbeing and the difficulties encountered when assessing clinical risk.

"The need for high dependency care is provided for those women with conditions perceived or known to be life threatening" (D 54)

"Those requiring H.D.U. care fall into a group of people who have been deemed "high risk" for their condition to deteriorate and there is an element of subjectivity to applying this to individuals needs e.g. postpartum haemorrhage over 1000-1500 mls is considered "high risk" but a patient may be demonstrating 'deleterious' symptoms from a much smaller loss of blood." (C 57)

The respondents' narratives described a continuum of clinical risk (either actual or perceived) that centred on the potential for, or presence of physiological deterioration

(Figure 4-1). The assessment of clinical risk influenced the degree of vigilance and type of care required by women.

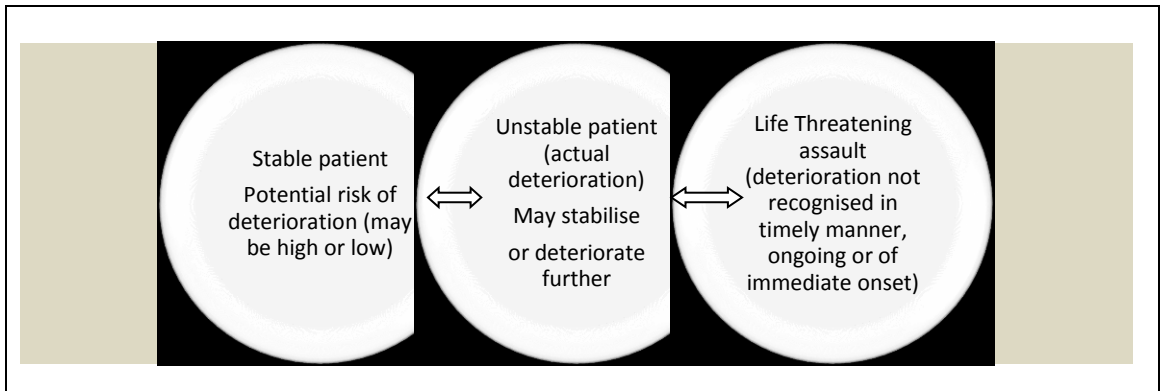


Figure 4-1 The continuum of clinical risk and potential for physiological deterioration

4.3.6 Emotional / psychosocial

The emotional / psychosocial category reflected the comments of respondents who felt that MHDC might also be required for women with psychological and social needs, including those diagnosed with intrauterine death (IUD).

“Care of women following stillbirth (emotional high dependency)” (A 29)
“The provision of concentration of care may be on a physical, psychological, or social basis, in an acute situation”. (C 41)

Respondents identified that women with complex psychological needs such as puerperal psychoses and those experiencing domestic violence might also require MHDC, but a degree of uncertainty was evident.

“High dependency care is when an increased involvement of varying team members in response to a physical or psychological / psychiatric event – there may be high social dependency but this is probably not due to “maternity” – difficult however to be sure.” (E 77)

4.4 Vigilance

The theme of ‘vigilance’ encompassed the actions required to anticipate and detect clinical changes and physiological deterioration. It included the observation and

monitoring required by acutely ill women, staff to patient ratios, medical review, investigations and record keeping as outlined in Table 4-3.

Theme	Category	Subcategories (where applicable)
Vigilance	Observation and monitoring (section 8)*	<ul style="list-style-type: none"> • Nature of observation and monitoring • Frequency of monitoring and observation • Non-invasive monitoring • Invasive monitoring • Early Warning systems
	Staff to patient ratio / staff presence (section 9)*	
	Medical review (section 9)*	<ul style="list-style-type: none"> • Frequency • Lead Clinician •
	Investigations (section 9)*	
	Record keeping (section 9)*	

Table 4-3 Delphi survey round one theme of vigilance showing the categories and subcategories

4.4.1 Observation and monitoring

The observation and monitoring category consisted of 5 sub categories (the nature and observation of monitoring, frequency of monitoring and observations, non-invasive monitoring, invasive monitoring and early detection of clinical deterioration using Early Warning Systems). The nature of observation and monitoring described the ‘non-specific’ views that the respondents held regarding the level of observation and monitoring women required when receiving MHDC. Respondents frequently mentioned women requiring more, close, detailed, intense, a greater level of, and, additional observation and monitoring. The frequency of monitoring that women required when receiving MHDC ranged from more frequently than 4 hourly, to every 15 minutes or continuously.

“Women needing greater than 4 hourly observations” (A 34)

“Pulse and BP should be recorded hourly when the patient is stable, but may be required as often as every 5 minutes” (B 38)

Non-invasive monitoring included temperature, pulse, blood pressure, respiratory rate, pulse oximetry, fluid balance, neurological observations and ECG monitoring. Invasive monitoring included the use of CVP lines, arterial lines and pulmonary artery / Swann Ganz lines. This subcategory contained of a large amount of data suggesting a strong association between MHDC and the requirement for invasive monitoring that required further exploration during the second round.

The use of EWS were identified as being important for detecting those women requiring MHDC and those women who were receiving MHDC but could deteriorate physiologically. Respondents used differing acronyms to describe the EWS including PAR (patient at risk), MEOWS (modified obstetric early warning system) and Mat MEWS (Maternity Modified Early Warning Score).

4.4.2 Staff to patient ratio and staff presence

Many respondents identified that women receiving MHDC required one to one care whilst a smaller number of respondents identified a staff to patient ratio of one staff member to two patients. Respondents also mentioned staff needing to be in 'constant' or continual attendance' of a woman requiring MHDC.

4.4.3 Medical review

The medical review category consisted of the subcategories of 'frequency of reviews' and 'lead clinician'. Respondents identified the need for regular and formal medical reviews a minimum of 4 to 6 hourly. Some respondents also mentioned the importance of informal medical reviews in addition to those scheduled formally. There were variations as to whom the lead clinician managing and taking overall responsibility for a woman's MHDC should be. Some respondents identified that the consultant

obstetrician should take the lead, others suggested the consultant anaesthetist and some stated there should be joint lead clinicians.

4.4.4 Investigations

The respondents identified that women receiving MHDC were likely to require regular or frequent investigations. These investigations included blood tests and arterial blood gas analysis, an increased need for imaging, mainly X-rays and ultrasound scan

4.4.5 Record keeping

A large number of respondents commented on the use of high dependency or intensive care charts to record a woman's clinical progress. A small number of respondents referred to the use of electronic high dependency charts that had direct links to haematology, biochemistry and radiology results.

4.5 Interventions

The interventions theme consisted of the categories of post-operative care, step down care, care planning, multidisciplinary referral and transfer, treatments and the level of intervention describing MHDC (Table 4-4).

Theme	Category	Subcategories (where applicable)
Interventions	Post operative care (section 10)*	
	Step down care (section 10)*	
	Care planning (section 10)*	
	Multidisciplinary referral and transfer (section 10)*	<ul style="list-style-type: none"> • Medical staff (excluding intensivists) • Critical care team and outreach service input • Paramedical involvement • Nursing input (excluding critical care nurses) • Patient transfer to a specialist area
	Treatments (section 10)*	<ul style="list-style-type: none"> • Administration of medication and fluids • Regional pain relief • Complex treatments (excluding medications and fluids) • General maternity care
	Intervention level; Description of MHDC (section 11)*	<ul style="list-style-type: none"> • Subjective • Objective

Table 4-4 Delphi survey round one theme of interventions showing the categories and subcategories

4.5.1 Post-operative care

The post-operative care category included those women who required immediate post-operative care during the first hour following lower segment caesarean section (LSCS), women receiving routine post-operative care up to 24 hours post LSCS and women who required 'prolonged' post-operative care as they had not recovered in a timely and appropriate manner.

4.5.2 Step down care

Step down care was seen as an indication for MHDC by some respondents, who identified that women returning from ICU required closer monitoring and / or support than could be offered on a postnatal ward.

"A labour ward room may also be used as a step-down facility for patients who no longer require HDU, ITU, or CCU care, but who are not yet ready for discharge to the postnatal wards." (B 38)

"Women who have been receiving intensive care but still requiring Additional advice / support" (F 24)

4.5.3 Care-planning

Significant numbers of respondents identified the importance of women having structured plans of care to ensure a coordinated approach to MHDC provision. Respondents stressed that care plans needed to be reviewed and updated on a regular basis.

4.5.4 Multidisciplinary referral and patient transfer

The multidisciplinary referral and transfer category comprised specialist medical staff, CCOT, paramedical involvement and nursing input (excluding critical care nurses). Specialist medical staff (excluding intensivists) included radiologists, haematologists, cardiologists, surgeons, physicians and microbiologists. Referral to those professionals with the appropriate expertise were seen as a vital characteristic of MHDC provision. The importance of multidisciplinary team working and communication were seen to be key in the decision to escalate a woman's care;

"The decision to institute high dependency care should be multi-disciplinary" (B 34)

"If any member of staff is concerned about a mother, they should feel free to ask if high dependency care is required." (B 38)

One respondent summarized the multidisciplinary approach to MHDC by stating;

"It is not one to one care it is one to team care." (E 20)

The respondents' significant number of qualitative comments suggested strong associations with ICU staff and CCOT. The importance of involving the CCOT in decisions relating to women who required or were receiving MHDC was apparent.

"Close liaison with adult intensive care units is mandatory in determining the best place / type of care for these women" (A 3)

"We have a v. good relationship with our ITU and they have a critical care outreach team that promotes on-going support and assessment on the wards...." (G 62)

The respondents also emphasised that when caring for a woman receiving MHDC the maternity care team should be prepared to transfer the woman to a higher level of care such as intensive or coronary care if her condition dictated, or she could not receive appropriate care on the labour ward. Additional support for women receiving MHDC included care from paramedical staff including physiotherapists and Operating Department Practitioners (ODPs). Although the paramedical subcategory contained less data it was included in the second round questionnaire to ensure all respondents' views were acknowledged and included.

4.5.5 Referral to nurses (excluding critical care nurses)

A significant number of respondents suggested that nurses could be involved in supporting midwives to care for women requiring MHDC.

“Nurses should not be discounted in providing specialised care if they have the requisite skills providing they are not taking on the midwifery elements of care” (D 31)

Theatre, recovery and anaesthetic nurses were the most commonly mentioned. Many respondents also stated that women requiring MHDC needed more 'nursing' input.

“High dependency care involves increased nursing care” (E 10)

4.5.6 Treatments

The treatments category consisted of four subcategories; the administration of medication and fluids, regional pain relief, complex treatments (excluding medications and fluids) and general maternity care. The medications and fluids subcategory contained a significant number of medications. These are summarised in Figure 4-2 and were included in the round two questionnaire.

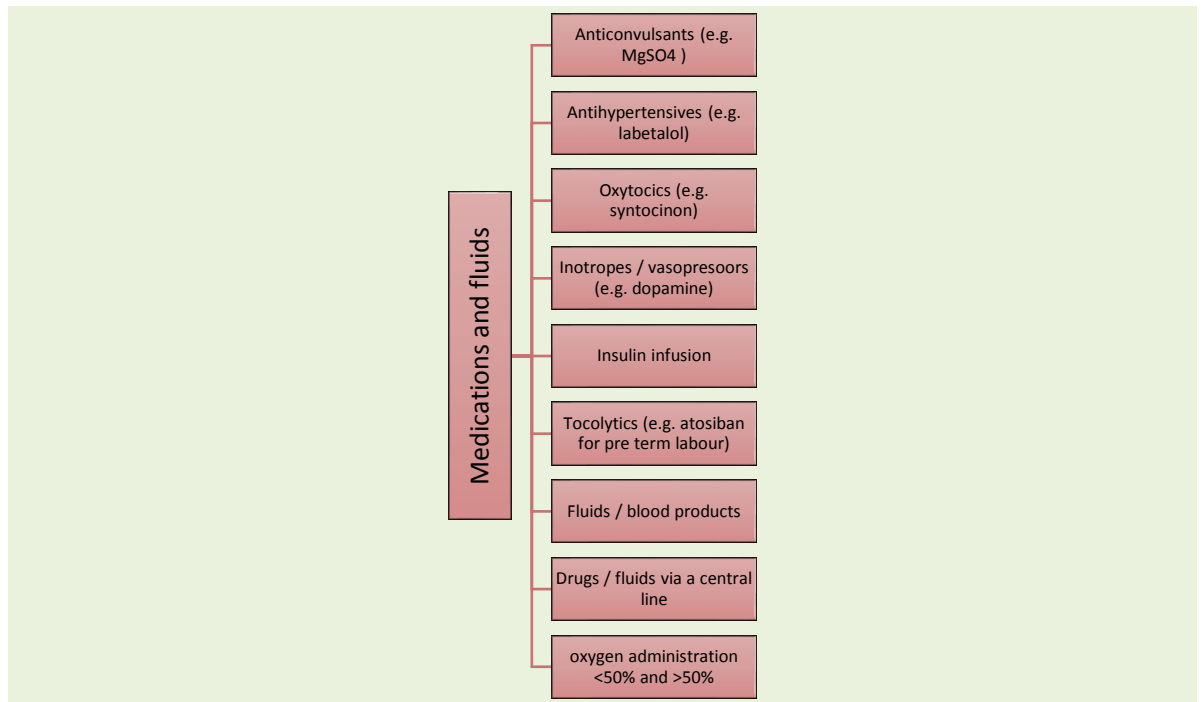


Figure 4-2 The administration of medications and fluids subcategory

The regional pain relief subcategory included epidural anaesthesia administered for intrapartum and / or postnatal pain relief.

The complex treatments subcategory included non-invasive ventilation in the form of continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BIPAP). Intubation and ventilation and renal support were also identified as interventions that were components of MHDC.

“Acute reversible failure of an organ system (e.g. need for ventilation or renal support) in a patient with chronic impairment of one or more organ systems” (B 38)

General maternity care encompassed basic maternity care interventions and these are summarised in Figure 4-3.

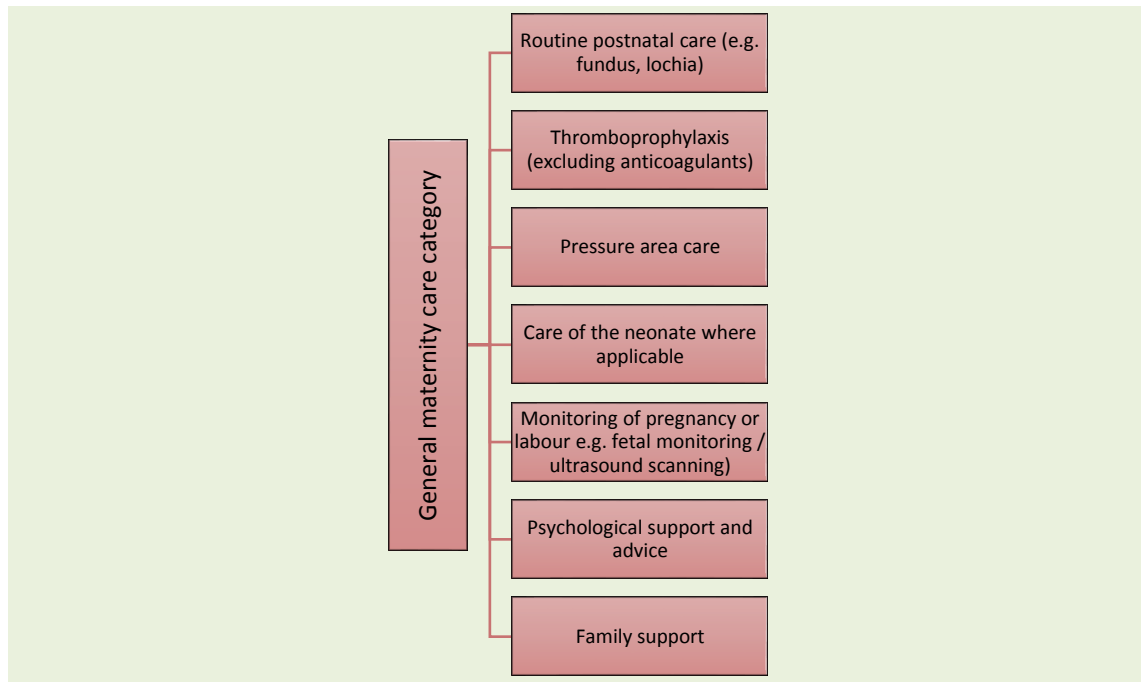


Figure 4-3 The general maternity care category

4.5.7 The intervention level (description of MHDC)

The 'intervention level' category included the 'subjective' definitions for MHDC and 'objective' classifications for MHDC using the ICS (2009) levels of care.

Four broad subjective definitions for MHDC emerged from the respondents' data:

1. Care that falls outside of 'normal' or 'routine' maternity care.
2. An interim level of care that falls between 'normal' maternity care and 'intensive' care.
3. Specialist care that is not intensive care
4. It is the same care as is provided in intensive care units.

One respondent highlighted the difficulties in defining MHDC by stating:

"Difficult one to quantify. That which does not constitute low dependency care!" (A 3)

A small number of respondents also described MHDC in objective terms by referring to the ICS levels of critical care for adults. Of the three levels of care, levels 1 and 2 were

referred to the most frequently as representing MHDC, although a smaller number of respondents did suggest level 3 care was also applicable.

“High dependency care in the maternity setting is graded as any critical care, level 1, 2, and 3.” (D 15)

4.6 Service Delivery

The service delivery theme encompassed the MHDC environment, professional aspects relating to service provision, the use of clinical guidelines and the need for funding and resources (Table 4-5).

Theme	Category	Subcategories
Service Delivery	Environment	<ul style="list-style-type: none"> • Location for MHDC • Facilities and equipment • Service availability
	Professional aspects	<ul style="list-style-type: none"> • Competence of staff • Education and training • Skill mix
	Guidelines	<ul style="list-style-type: none"> • Local • National
	Funding and resources	

Table 4-5 Delphi survey round one theme of service delivery showing the categories and subcategories

4.6.1 The environment

The environment category included the location for MHDC, the facilities and equipment required, and the availability of MHDC services. The respondents had varying opinions as to the location for MHDC. Whilst many of the respondents specified the labour ward as being the location of choice for MHDC, others emphasised the location would be dependent on a number of interrelated factors:

“The care is usually carried out within the delivery suite setting – where there is the availability of single rooms” (D 52)

“The location for giving care to this group of women (i.e. delivery suite, high dependency unit, intensive or coronary care) will vary dependent on their condition, workload, equipment and the availability of appropriate skills and expertise.” (B 34)

Respondent C17 stated the type of hospital would govern the location of MHDC:

“Tertiary referral centres are likely to have a specific location to which women are sent for HDC. In most DGH’s the HDC will come to the patient”

Only a small number of respondents alluded to the Intensive Care Society's (2009) guidance that the location of care must not influence the level of care a woman required (ICS 2009);

"The constitution of high dependency care is not venue dependent...." (C 4)

The facilities required to provide MHDC included basic room requirements (e.g. adequate lighting, ventilation, piped oxygen and suction, adequate power sockets, telephone and computer terminals, alert systems), in conjunction with the relevant equipment, emergency medications, and consumables.

"HDU standard equipment which will include [invasive monitoring e.g. CVP /arterial lines]" (B 25)

"Monitoring and equipment: HDU / ITU beds, routine monitoring capable of invasive pressure monitoring – 1 per bed, infusion pumps, syringe drivers, ITU / HDU style bays per bed, fluid warmers, warming blankets, emergency drugs, packs for emergency situations – malignant hyperthermia, anaphylaxis, latex allergy etc." (C 23)

Respondents stressed the need for MHDC provision to be available at all times, rationalising that women may deteriorate rapidly and require swift care escalation although there were differences in opinion as to how MHDC might be provided in individual OUs. It appeared that there were local variations and these were factors outside the control of the respondents.

"How it is delivered will depend upon local resources both in staffing and accommodation and equipment" (A 3)

"We don't have the facility for ECG monitoring or any of those below [arterial lines, CVP lines, pulmonary artery flotation catheters] other units probably do. Our women would go to ITU / CCU." (Respondent G 28)

Staff from the 3 smallest OUs commented more frequently about the lack of available equipment meaning they could not provide all aspects of MHDC. However, the respondents also highlighted that with increasing demands on critical care and other specialist units the necessity for MHDC provision was increasing.

“With the increase in pressure on these areas (ITU / HDU / CCU) it will become necessary to provide an increased level of care to these women on LW if they cannot be transferred.” (G 62)

4.6.2 Professional aspects

The competency of staff to provide MHDC was associated with an in-depth knowledge (including the ability to interpret blood test results and understand the pathophysiology of conditions), a high level of skill (e.g. the ability to care for women receiving complex care) and experience. The importance of individuals possessing skills relating to airway management, resuscitation and care of women with invasive monitoring and multiple intravenous infusions were highlighted.

“Enhanced level of skill required by the health professionallikely to have had several years experience” (F 33)

“May involve CVP lines, multiple infusions, complex equipment, all of which requires more than basic knowledge of acute care” (A 27)

The respondents emphasised that relevant professional education and training in the form of skills drills and clinical updates were pre-requisites for those involved in the provision of MHDC. Respondents acknowledge the need for staff education related to complex monitoring such as invasive monitoring whilst others focused on basic aspects that included vital signs and fluid balance.

“Extended training in haemodynamic monitoring, neurological assessment” (1 P)

“Training: Importance of observations, fluid balance, resuscitation. Regular training by clinicians” (G 64)

The appropriate skill mix of staff in terms of senior obstetricians, anaesthetists and midwives competent care for women receiving MHDC were cited as important factors in MHDC delivery.

“There should be an identified person (or group) in each (shift) on call, who is well trained on these conditions...” (E 5)

A proportion of respondents identified an inadequate skill mix of midwives as an impediment to the provision of MHDC. Direct entry midwifery training was also highlighted as a potential barrier to MHDC provision and respondents expressed concerns that midwives trained by this route may not have the necessary skills to provide MHDC.

"I have concern about whether the new midwifery training qualifies them for this (looking after sicker patients)" (E 10)

"Concern with increased number of direct entry midwives with no basic nursing training" (P 2)

4.6.3 Guidelines

Robust local guidelines underpinning the provision of MHDC were seen as integral aspects of MHDC provision by the respondents.

"Policies / guidelines - regularly updated, evidenced and multiprofessional" (F 34)

Respondents also highlighted the influence of national reports on MHDC provision including the Confidential Enquires into Maternal Deaths and British Association of Perinatal Medicine documents.

4.6.4 Funding and resources

Respondents acknowledged the resource intense nature of MHDC with adequate funding for MHDC equipment and staff education and training was paramount.

"Staff training and education – need Trust board commitment to provide funding." (D 50).

Respondents also highlighted the importance of having adequate midwifery staffing levels on the labour ward in order to provide MHDC. Where resources and funding were perceived as inadequate, respondents reported dissatisfaction with the level of service provided for those women requiring MHDC.

"The environment, equipment, training and staffing levels do not lend themselves to the provision of adequate HDU care" (C 30)

4.7 Synopsis

This chapter has described the findings of the first (qualitative) round of the Delphi survey. The themes and categories emerging from the first round Delphi and the associations between categories are summarised in Figure 4-4.

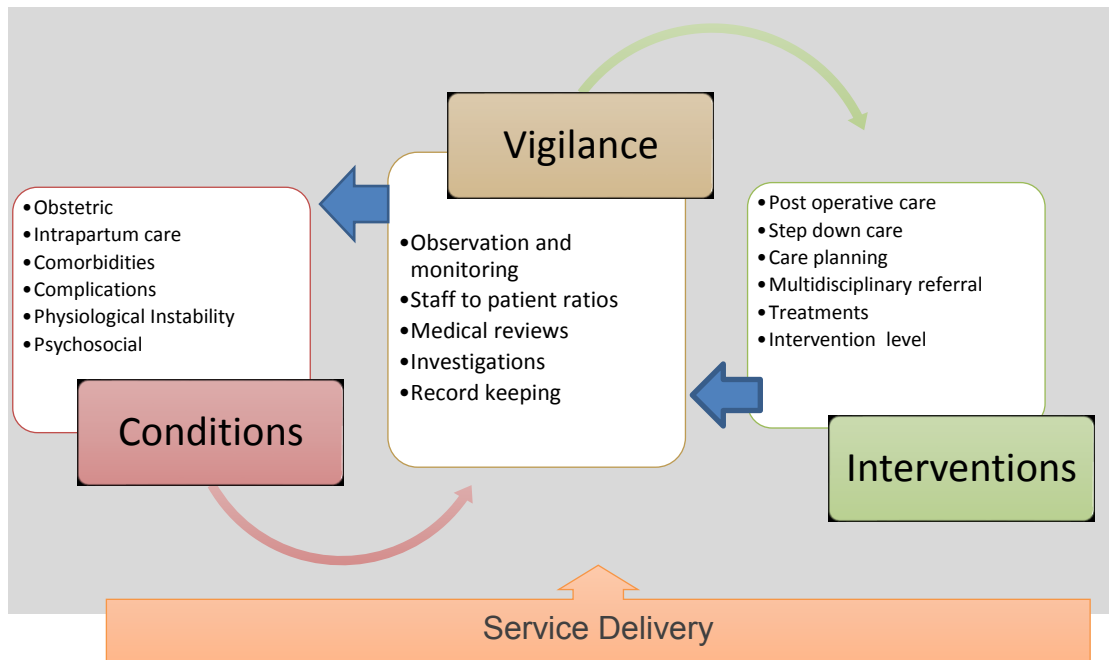


Figure 4-4 Schematic portrayal of the round one themes, categories and their associations

Chapter 5 presents the findings of the second round Delphi survey which asked respondents to rate their level of agreement or disagreement with 106 statements (derived from the first round results) using five point Likert items, as described in section 3.3.5.3.

Chapter 5 Results of Delphi Survey (Round Two)

5.0 Introduction

This chapter reports the findings of the second round of the Delphi survey. The results are presented in the following order:

- 1) For the whole respondent group.
- 2) For respondents representing OU groups with similar birth rates.
- 3) By the professional groups of doctors and midwives representing OU groups with similar birth rates.

The combined percentage of SA / A / SD/D / NAND and missing responses are reported, including examples of the respondents' comments. The development of the third round questionnaire is discussed thereafter.

5.1 Round two response rates

During round two, n= 85 questionnaires were distributed to the respondents who returned the round one questionnaire, n =74 were returned, response rate (87%).

Despite non-responders (13%), all professional titles were represented by the cohort, upholding panel stability. A mixture of midwives and doctors represented each OU, although the ratio of midwives to doctors was not equal across every OU as shown in Table 5-1.

	Maternity Unit code (number of respondents)							
Professional Title (Midwives)	A	B	C	D	E	F	G	Total
Band 6 midwife	1	3	2	1	0	0	0	7
Band 7 midwife	0	2	1	1	1	1	2	8
Labour Ward Manager	1	1	0	0	0	1	0	3
Head of Midwifery	0	0	0	1	0	0	0	1
Practice Development / Education Midwife	1	0	0	0	1	0	1	3
Midwifery Risk Manager	1	1	0	1	0	1	0	4
Supervisor of Midwives	0	2	2	3	2	1	1	11
Total number of midwives	4	9	5	7	4	4	4	37
Professional Title (Doctors)	A	B	C	D	E	F	G	Total
Consultant Obstetrician - labour ward lead	1	1	0	1	0	1	0	4
Consultant Obstetrician (not labour ward lead)	1	0	2	1	1	2	0	7
Specialty Registrar in Obstetrics and Gynaecology	2	2	2	0	0	2	0	8
Staff Grade Doctor / Associate Specialist (Obstetrics and Gynaecology)	0	0	1	0	1	0	1	3
Consultant Anaesthetist with Lead responsibility for Obstetrics	0	1	1	1	1	1	0	5
Specialty Registrar in Anaesthetics	1	1	1	2	0	0	0	5
Staff Grade Doctor / Associate Specialist (anaesthetics)	0	2	1	2	0	0	0	5
Total number of Doctors	5	7	8	7	3	6	1	37
Total number of respondents (Doctors and Midwives)	9	16	13	14	7	10	5	74

Table 5-1 Summary of round two respondents, according to professional title and OU.

The attrition rate during round two was higher for the midwives (15.9% non-responders, n=7) than the doctors (9.8% non-responders, n=4). When reviewing overall attrition rates for each OU, Unit F had the highest attrition rate (23.1 % non-responders, n=3) and Unit B had the lowest attrition rate (5.9% non-responders, n=1). Whilst every OU was represented by a combination of doctors and midwives, the job titles within these overarching professional groups varied across the OU. Unit G had the lowest number of respondents (n=5) and this group was represented by four midwives and only one doctor.

5.2 Results for all Obstetric Units combined

The following key applies for all tables summarising Delphi results from this point onwards:

KEY

Purple shaded box denotes $\geq 80\%$ <100% consensus response achieved.

Green shaded box denotes 100% consensus achieved.

5.2.1 Delphi survey round two results for sections one and two of the questionnaire

There was consensus that 5 of the 7 conditions in section one were indications for MHDC (Table 5-2). The respondents' comments suggested that the severity of the condition and the physiological stability of the woman would influence the need for MHDC, or alternatively, intensive care.

Approximately a third of the respondents agreed that obstetric cholestasis (33.8%) and gestational diabetes (33.1%) were indications for MHDC. Qualitative comments identified that respondents' decisions to instigate MHDC may alter if these conditions became severe or acute.

A third of the respondents agreed that high-risk labour was an indication for MHDC but a small number of qualitative comments suggested this constituted routine obstetric care.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Sections 1 and 2: Please rate how strongly you agree or disagree that the conditions / events listed below are indications for maternity high dependency care (MHDC).							
1a	Hypertensive disorders (e.g. moderate to severe pre-eclampsia, HELLP, eclampsia)	5 (1)	98.6	0	1.4	0	Although ticked agree for 'a' I do not agree that moderate pre-eclampsia is an indication for MHDC (F 36)
1b	Obstetric haemorrhage	5 (0)	97.3	0	2.7	0	If the above conditions (a-g) are severe I would prefer them in ITU as the maternity unit is distant from the main hospital (B 18)
1c	Suspected Amniotic Fluid Embolism	5 (0)	93.3	0	6.7	0	Possibly require ICU admission if very unwell (E 20; strongly agree)
1d	Confirmed Amniotic Fluid Embolism	5 (0)	97.2	2.8	0	0	Amniotic fluid embolism confirmed indicates ICU care (i.e. a level up from MHDC). High dependency care is inadequate. (F 14; strongly disagree)
1e	Obstetric Cholestasis	3 (2)	33.8	36.5	29.7	0	Would not routinely consider this as an indication for MHDC but if either condition severe / acute this would alter (A 33; disagree)
1f	Acute fatty liver	5 (1)	85.1	5.5	8.2	1.4	Possibly require ICU admission if very unwell (E 20; strongly agree)
1g	Gestational diabetes	3 (2)	31.1	48.6	18.9	1.4	
2a	Low risk labour	1 (0)	1.4	98.9	0	0	Would aim for 1:1 care but see this is normal best practice not an indication of MHDC" (E 33; strongly disagree).
2b	High risk labour	3 (2)	31.1	48.6	18.9	1.4	I assume by MHDC you mean requiring intervention over and above normal high risk care e.g. CTG/BP/IV access/reg review to all high risk women/ babies (F 1: disagree) "Would see this as normal range of care" (A 33; disagree)

Table 5-2 Delphi survey round two results for sections one and two, for all respondents combined.

5.2.2 Round two results for section three

Section 3 of the questionnaire related to pre-existing conditions (Table 5-3).

Of the 12 pre-existing conditions listed as potential indications for MHDC only diabetes and cardiac conditions achieved consensus responses. Five pre-existing conditions had median scores of 4, yet did not meet the $\geq 80\%$ consensus threshold, reflecting the spread of opinions. Additional comments highlighted that the severity of the condition and the physiological impact on the woman would influence the need (or not) for MHDC.

Four statements scored medians of 3. 'Any comorbidity' was identified as being too vague, whilst autoimmune disorders generated one comment, with the respondent identifying that a lack of knowledge prohibited him / her answering. Obesity generated several qualitative comments with respondents stating women classed as 'morbidly obese' were more likely to require MHDC. Physical disabilities generated a median score of 2 with respondents identifying that individualised assessment was required.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Section 3: Please rate how strongly you agree or disagree that the pre-existing conditions listed below are indications for MHDC.							
3a	Any co morbidity	3 (1)	12.2	37.8	48.6	1.4	3a, b, c could present in their severe form and require high dependency care. Any one displaying more severe symptoms in any of these conditions could be in the 'strongly agree' category. C 41: neither agree nor disagree for 3a, b, and c).
3b	Diabetes (e.g. unstable despite sliding scale insulin, ketoacidosis)	4 (1)	94.6	1.4	4.0	0	Comment as above
3c	Cardiac conditions (e.g. valvular heart disease, cardiomyopathy, arrhythmias)	4 (1)	83.8	2.7	10.8	2.7	Comment as above
3d	Renal conditions (e.g. chronic kidney disease)	4 (2)	56.7	9.5	32.4	1.4	"Depends what it is, severity, impact, when etc." (A 33; neither agree nor disagree)
3e	Liver conditions	4 (1)	50.0	9.5	39.2	1.4	"Depends what it is, severity, impact, when etc." (A 33; neither agree nor disagree)
3f	Respiratory conditions (e.g. severe asthma)	4 (1)	64.9	6.8	28.4	0	Depends what – mild disease no (D1; agree)
3g	Autoimmune disorders (e.g. systemic lupus erythematosus, antiphospholipid syndrome)	3 (1)	41.9	20.3	36.5	1.4	I don't know sufficient about this to make a more definite view (C14: neither agree nor disagree)
3h	CNS disorders (e.g. epilepsy)	3 (2)	27.0	25.7	44.6	2.7	
3i	Haematological disorders (e.g. sickle cell disease / crisis)	4 (1)	59.5	8.1	32.4	0	
3j	Organ transplantation	4 (1)	62.1	12.2	37.8	0	
3k	Physical disabilities (e.g. causing immobility)	2 (1)	19.0	55.4	23.0	2.7	I don't think this necessarily constitutes high risk. I think each individual should be assessed according to their specific needs rather than being labelled as high risk (D31; missing comment)
3l	Obesity	3 (2)	33.8	37.8	24.3	4.1	"Obesity is becoming an increasing problem – again some obese women can be quite 'fit' - this needs individual assessment". (D 31, missing response). "Morbid obesity – agree, simple obesity no" (B 18, disagree).

Table 5-3 Delphi survey round two results for section three, for all respondents combined.

5.2.3 Round two results for sections four and five

Sections 4 and 5 of the questionnaire related to results from the round one categories of complications and physiological instability (Table 5-4). Three of the five section four statements generated $\geq 80\%$ SA/A responses. Respondents highlighted that the level of care required by a woman with a surgical complication would be governed by the cause of the surgical complication. All of the section 5 statements relating to physiological instability achieved consensus responses. General comments made by the respondents indicated that whilst women with the specified complications would require MHDC, transfer to ICU or another specialist unit may be more appropriate.

5.2.4 Round two results for section six

Section 6 of the questionnaire examined the emotional / psychosocial circumstances that may lead women to require MHDC (Table 5-5). Two of the 4 statements scored medians of 2. Qualitative comments indicated that for a woman suffering a fetal loss, 'close monitoring' or 'normal care' would be required as opposed to MHDC although the reason for the intrauterine death would need to be considered. Two respondents intimated that MHDC may take the place of specialist services;

"More likely to need care in specialist unit than MHDC- and availability of MHDC should not be allowed to take pressure off provision of appropriate specialist services." (F 14)

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Sections 4-5: Please rate how strongly you agree or disagree that the complications / conditions listed below are indications for MHDC							
4a	Suspected DVT/PE	3 (1)	47.3	21.6	31.1	0	"PE yes DVT no" (D1; neither agree nor disagree)
4b	Confirmed DVT/PE	4 (1)	83.7	4.1	12.2	0	Pulmonary embolism but not DVT (B29 agree)
4c	Sepsis	4 (1)	95.9	1.4	0	2.7	Or ITU. (C18; strongly agree)
4d	DIC	5 (0)	95.9	1.4	0	2.7	Depends (B1; neither agree nor disagree)
4e	Surgical complications	4 (2)	71.6	2.7	23.0	2.7	[Section 4, general comment] "DVT, chest infection, surgical complications usually do not require MHDC. But on the other hand PE, septicaemia and peritonitis or bowel obstruction as a result of surgery will require MHDC" (C 8)
5a	Physiological compromise	5 (1)	94.6	5.4	0	0	Most of the above [5a-e] would probably need level 3 (ICU /ITU) care not just HDU on labour ward (D 50, general comment)
5b	Signs / symptoms of shock	5 (0)	97.3	2.7	0	0	
5c	Organ dysfunction	5 (1)	93.3	4.1	2.7	0	'organ dysfunction' clinical versus laboratory (B1 ; neither agree nor disagree)
5d	Organ failure	5 (0)	96	4.1	0	0	[Section 5] "Some of these conditions may be better managed on ICU / medical" (F 26, general comment)
5e	Maternal collapse	5 (0)	94.6	4.1	1.3	0	Acute event needs treatment in any area. After event, level of care dependent on cause – from normal to ICU (F 14; strongly disagree)

Table 5-4 Delphi survey round two results for sections four and five, for all respondents combined.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Section 6: Please rate how strongly you agree or disagree that the following clinical circumstances would lead you to classify a woman as requiring MHDC.							
6a	Fetal loss e.g. intrauterine death	2 (1)	18.9	59.5	20.3	1.4	Any woman who has suffered a fetal loss will be closely monitored dependent on why the loss occurred. (D31; agree) Depends on cause of stillbirth etc. (F2; neither agree nor disagree) Would see this is normal 1:1 care (B33, neither agree nor disagree)
6b	Mental illness	3 (1)	23.0	43.2	33.8	0	"Mental illness and psychosis will not require MHDC but a different type of care". (C 8; 6b and 6c neither agree nor disagree)
6c	Puerperal psychosis	4 (2)	52.7	33.8	13.5	0	[Comments for a-d] These issues need psychiatric perinatal service care in a mother /baby unit not HDU (D1: strongly disagree)
6d	Domestic violence	2 (1)	14.9	63.5	21.6	0	See as normal care (B33; disagree) These issues need psychiatric perinatal service care in a mother /baby unit not HDU (D1, strongly disagree for 6a-6d)

Table 5-5 Delphi survey round two results for section six, for all respondents combined.

5.2.5 Round two results for section seven

Section 7 of the questionnaire related to the Delphi round one category of clinical risk (Table 5-6). Two of the 7 statements achieved consensus responses. A condition threatening maternal life received no additional comments whilst comments relating to 'a woman who is critically ill' suggested ICU might be more appropriate than MHDC. Four statements recorded median scores of 4, but did not reach 80% consensus. The statement 'a condition with life threatening potential' had the smallest range of scores and was closest to achieving a consensus response. Respondents' qualitative comments identified that clinical risk needs to be quantified and tangible in order to implement MHDC.

5.2.6 Round two results for section eight

Section 8 of the questionnaire consisted of twelve statements relating to the observation and monitoring of women receiving MHDC (Table 5-7). Six of the section eight statements gained consensus responses whilst 'fluid balance' bordered on a consensus response. A large number of respondents indicated that the type and frequency of clinical monitoring undertaken would be determined on a case-by-case basis. Some respondents suggested women requiring continuous ECG monitoring, neurological observations and /or invasive monitoring with arterial lines should be cared for on ICU. Furthermore, a large number of respondents stated that women needing Swan Ganz monitoring should receive care on an ICU as opposed to receiving MHDC. The respondents' comments highlighted varying opinions as to when and where EWS should be used. Examples of early warning systems were specified as part of this statement (e.g. MEWS, MEOWS, Patient at Risk (PAR) scoring) however, some respondents identified they were not familiar with these.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Section 7: Please rate how strongly you agree or disagree that the following clinical scenarios would lead you to classify a woman as requiring maternity high dependency care							
7a	At risk due to deviation from norm	3 (2)	28.4	40.5	29.7	1.4	<i>You could argue, any pregnancy can become life threatening - it is recognizing deviations from norm and implementing MHDC when appropriate that is the key (T 32; general comment)</i>
7b	High risk of deterioration	4 (1)	56.7	14.9	27.0	1.4	
7c	Serious concerns re maternal health	4 (2)	70.2	8.1	16.2	5.4	
7d	Condition with life threatening potential	4 (1)	75.7	6.8	16.2	1.4	<i>You can't admit people who "might" be ill or it will be untenable". (A1; neither agree nor disagree for 7a-7f).</i>
7e	Condition threatening maternal life	5 (1)	89.2	2.7	6.8	1.4	
7f	Condition threatening fetal life	4 (2)	67.6	18.9	12.2	1.4	<i>Any condition, potential, that is everyone! (B1; general comment).</i>
7g	Woman who is critically ill	5 (0)	93.3	4.1	1.4	1.4	<i>By definition requires critical care (ICU) not high dependency care (F 14; strongly disagree)</i>

Table 5-6 Delphi survey round two results for section seven, for all respondents combined.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Section 8: In relation to the observation and monitoring of women, please rate how strongly you agree or disagree that the statements below represent features of maternity high dependency care.							
8a	Vital signs < 4hrly but > or = hourly	3 (2)	40.6	44.6	14.9	0	May be required as part of step down care (F 36; disagree)
8b	Vital signs < hourly	4.5 (1)	86.5	1.4	12.1	0	Will depend on clinical case (C7, agree for a, b, and c)
8c	Continuous monitoring vital signs	5 (1)	90.6	1.4	8.0	0	Some (D24; strongly agree)
8d	Non invasive monitoring e.g. BP, respiratory rate	4 (2)	60.8	20.3	17.6	1.4	Depends why
8e	Continuous ECG	4 (1)	86.4	4.1	9.5	0	? ICU (F 26; strongly disagree)
8f	Level of consciousness / neurological observations	4 (1)	86.4	5.4	5.4	2.7	May need intensive care? (G12; agree)
8g	Accurate monitoring of fluid balance (e.g. catheter / hourly measurements)	4 (1)	79.7	10.8	9.5	0	Pre eclampsia / sepsis (D24; strongly agree)
8h	Observe blood loss	4 (3)	56.7	24.4	16.2	2.7	MEWS etc. and observation of blood loss appropriate for all women (B 29; general comment).
8i	Invasive monitoring i.e. CVP	5 (1)	82.4	2.8	13.5	1.4	Will depend on clinical case (C7; agree)
8j	Invasive monitoring arterial line	5 (1)	82.5	5.5	12.2	0	Arterial lines should not be cared on labour ward (D23;
8k	Swan Ganz monitoring	5 (2)	70.3	23.0	6.7	0	Swan Ganz – should be in ITU if that sick (B 25; strongly
8l	Use of Early Warning Score	4 (2)	63.5	21.6	12.2	2.7	Generally designed to flag up patients on the ward and not appropriate for HDU/ICU (C 18; disagree) Use of MEWS performed on all surgery, so EL LSCS would have MEWS but routine post-op care rather than specific" high dependency care" (A 27; disagree) Should be used everywhere and is (D1; neither agree nor disagree)

Table 5-7 Delphi survey round two results for section eight, for all respondents combined.

5.2.7 Round two results for section nine

Section 9 of the questionnaire derived from the round one category of staff to patient ratio / staff presence and consisted of twelve statements (Table 5-8, p173). Three statements achieved $\geq 80\%$ SA/A responses. The respondents equated some statements with routine care provision that was not specific to MHDC.

5.2.8 Round two results for section ten

Section 10 of the questionnaire focused on the theme of 'interventions' comprising MHDC (Table 5-9, p174). There was consensus that step down care post ICU / CCU and involvement of the CCOT / transfer of a patient (e.g. to ICU or CCU) were components of MHDC by the respondent group. Statements 10b-10d centred on the provision of post-operative care and consensus responses were not achieved for these interventions.

The respondents achieved consensus that the administration of IV anti convulsants, antihypertensives, inotropes / vasopressors and drugs / fluids via a central line were components of MHDC. The respondents' comments suggested that the latter may be an indication for intensive as opposed to MHDC. The administration of IV oxytocics, fluids / blood products and tocolytics scored medians of 3 and comments suggested these formed parts of 'routine care'.

The administration of insulin infusions, oxygen therapy $>50\%$ by face mask, and $< 50\%$ by face mask achieved median scores of 4 but did not achieve the 80% level of consensus, despite a small number of respondents suggesting the need for facial oxygen might be an indication for intensive care.

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Section 9: Please rate how strongly you agree or disagree that the statements below are indicators of maternity high dependency care							
9a	One to one care	4 (3)	62.1	25.7	10.8	1.4	<i>Normal standard for low risk care (F14; strongly disagree)</i>
9b	One staff per 2 patients	2 (2)	29.7	54.0	14.9	1.4	<i>If [women] in same cubicle (E 10; agree)</i>
9c	Constant attendance of staff	4 (1)	77.0	12.1	9.5	1.4	<i>No comments</i>
9d	Formal medical reviews 4-6 hourly	4 (1)	77.0	12.1	9.5	1.4	<i>All labour wards should have a regular review (team) of the women – again this does not constitute high risk (D 31; disagree)</i>
9e	Informal medical reviews	4 (1)	64.9	14.8	17.6	2.7	<i>Applicable for all high risk clients (B 29; disagree) Meaningless (F 14; disagree)</i>
9f	Lead clinician consultant obstetrician	4 (2)	66.2	10.8	21.6	1.4	<i>The lead clinician might be a consultant depending on the rota. This does not necessarily signify high risk (D 31; agree)</i>
9g	Lead clinician consultant anaesthetist	4 (2)	71.6	10.8	16.2	1.4	<i>Some cases (D 24; agree)</i>
9h	Joint lead clinicians	4 (1)	85.1	2.7	10.8	1.4	<i>No comments</i>
9i	Regular and frequent investigations	4 (1)	85.1	2.8	9.5	2.7	<i>Sections i-l are more likely to be high risk (D31, general comment)</i>
9j	Increased use of imaging	4 (1)	58.1	10.8	28.4	2.7	<i>Only where needed (D1; neither agree nor disagree)</i>
9k	Recording of observations on HDU chart	5 (1)	91.9	0	5.4	2.7	<i>No comments</i>
9l	Use of electronic charts	4 (2)	68.9	6.8	16.2	8.1	<i>One day!! (C 18; agree) Would be optimal – but not available with my current maternity setting. (F 36; neither agree nor disagree).</i>

Table 5-8 Delphi survey round two results for section nine, for all respondents combined

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %
Section 10: Please rate how strongly you agree or disagree that the interventions listed below are components of maternity high dependency care.						
10a	Step down care post ICU/CCU	4 (1)	93.3	4.0	2.7	0
10b	Immediate post operative care	3 (2)	47.3	31.1	21.6	0
10c	Routine post op care up to 24 hours post LSCS	2 (1)	10.8	66.2	23.0	0
10d	Prolonged post operative care > 24 hours	4 (1)	71.6	5.5	21.6	1.4
10e	Structured and regularly updated care plan	4 (1)	58.1	16.2	24.3	1.4
10f	Frequent treatment episodes	4 (1)	73.0	2.7	23.0	1.4
10g	Referral to specialist medical staff	4 (0)	75.7	5.4	18.9	0
10h	Referral to paramedical staff	3 (2)	41.9	35.1	23.0	0
10i	Referral to nurses (excluding critical care nurses)	3 (2)	40.5	27.0	32.4	0
10j	Involvement of critical care outreach team or ITU	4 (1)	90.6	4.0	5.4	0
10k	Transfer of patient e.g. to CCU	5 (1)	90.5	1.4	5.4	2.7
10l	Administration of IV anticonvulsants	5 (1)	93.2	0	6.8	0
10m	Administration of IV antihypertensive	4 (1)	89.2	2.7	8.1	0
10n	Administration of IV oxytocics	3 (2)	27.0	44.6	28.4	0
10o	Administration of inotropes / vasopressors	4 (1)	86.5	5.4	6.8	1.4
10p	Administration of IV fluids / blood products	3 (2)	41.9	29.7	28.4	0
10q	Administration of insulin infusion	4 (1)	51.3	20.3	28.4	0
10r	Administration of tocolytics	3 (2)	35.1	36.5	28.4	0
10s	Drugs / fluids via central line	5 (1)	87.8	2.7	6.8	2.7
10t	Oxygen therapy >50% by face mask	4 (2)	72.9	8.2	17.6	1.4
10u	Oxygen therapy <50% by face mask	4 (1)	62.2	13.5	23.0	1.4
10v	Epidural anaesthesia for pain relief in labour	2 (2)	29.7	50.0	17.6	2.7
10w	Epidural analgesia excluding labour	3 (2)	29.7	25.7	40.5	4.1
10x	Non invasive ventilation	4 (1)	78.4	14.9	5.4	1.4
10y	Intubation and ventilation	5 (1)	78.4	20.2	0	1.4
10z	Renal support	5 (1)	80.5	18.1	1.4	0
10zi	Routine postnatal care	2 (3)	24.3	58.1	14.9	2.7
10zii	Thromboprophylaxis	2 (2)	31.1	50.0	14.9	4.1
10ziii	Pressure area care	3 (2)	40.5	44.6	10.8	4.1
10ziv	Care of neonate	2 (2)	35.1	48.6	12.2	4.1
10zv	Monitoring of pregnancy or labour	2 (2)	32.4	51.3	13.5	2.7
10zvi	Patient support	3 (2)	39.2	44.6	12.2	4.1
10zvii	Support for woman's family	3 (2)	44.6	40.5	12.2	2.7

Table 5-9 Delphi survey round two results for section ten, for all respondents combined.

A structured and regularly updated care plan (statement 10e) did not achieve consensus however, respondents' comments suggested this was an integral aspect of care for all women.

Statements 10v and 10w asked respondents to assess if epidural anaesthesia administered for intrapartum or postnatal pain relief were components of MHDC. Neither of these statements achieved a consensus response and respondents suggested that a woman receiving epidural analgesia constituted 'normal' one to one care, whilst some suggested this would be an 'incidental' component of MHDC.

Statements 10x-10y asked whether non-invasive ventilation (e.g. CPAP / BIPAP) or intubation and ventilation were components of MHDC. Whilst median scores of 4 and 5 were achieved respectively, some respondents suggested that intensive care was more appropriate than MHDC.

"Any active respiratory or renal support is critical care level 3 and not high dependency care as I see it" (D23, strongly disagree for 10x and 10y)

"Would be performed in ITU rather than in our dept." (A 27, strongly agree for 10x and 10y)

Renal support was agreed to be a component of MHDC although, a number of respondents identified that for women receiving renal support intensive care was more appropriate than MHDC.

"Any active respiratory or renal support is critical care level 3 and not high dependency care as I see it" (D 23; strongly disagree)

Statements 10zi - 10zvii inclusive scored medians of either 2 or 3 with none achieving ≥80% SD/D responses. The respondents' comments suggested these were interventions routinely undertaken for all women and not necessarily those requiring MHDC.

5.2.9 Round two results for section eleven (a and b)

Section 11a of the questionnaire focused on the 'subjective' definitions of MHDC as provided by the respondents during the Delphi survey round one (Table 5-10).

		Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %
Section 11a: Please rate how strongly you agree or disagree that the following statements describe MHDC						
11a	Care that falls outside normal maternity care	3 (2)	47.3	27.0	24.3	1.4
11b	Interim level of care between normal and intensive care	4 (0)	83.8	5.4	9.5	1.4
11c	Specialist care that is not intensive care	4 (0)	77.0	2.7	20.3	0
11d	Same care as is offered in ICU.	3 (2)	37.8	44.6	17.6	0

Table 5-10 Delphi survey round two results for section eleven (a) of the questionnaire for all respondents combined.

Only the statement 'an interim level of care between normal and intensive care' achieved consensus, although the statement 'specialist care that is not intensive care' almost achieved consensus. 44.6% of the respondents disagreed that MHDC was the same care as is provided in an ICU whilst 20.3% of respondents provided neutral responses for this statement.

Section 11b focused on the objective definition of MHDC according to the ICS levels of critical care for adults classification system (Table 5-11). A third of the respondents were familiar with the ICS levels of care. Of those who were familiar, 76% equated MHDC with level 1 care and 96% equated it with level 2 care. Only 48% of respondents equated MHDC with level 3 care.

Round 2 question 11 (section b) Are you familiar with the ICS levels of critical care for adults?	Yes 33.8% (n=25)	No 64.9% (n=48)	Missing 1.4% (n=1)
Please rate how strongly you agree or disagree that the following statements describe MHDC:			
	SA/A %	SD/D %	NAND %
Level 1 care as defined by the Intensive Care Society in 2009 (e.g. patient requiring a minimum of 4 hourly observations, demonstrating abnormal vital signs but not needing a higher level of critical care)	76.0 (n=19)	20.0 (n=5)	4.0 (n=1)
Level 2 care as defined by the intensive Care Society in 2009 (e.g. extended postoperative care, a minimum of hourly observations, patients who are having a single organ system supported)	96.0 (n=24)	0.0	4.0 (n=1)
Level 3 care as defined by the Intensive Care Society in 2009 (e.g. patients with 2 or more organs being supported)	48.0 (n=12)	44.0 (n=11)	8.0 (n=2)

Table 5-11 Delphi survey round two results for questionnaire section eleven (b) for all respondents combined.

5.3 Round two results analysed by Obstetric Units grouped by similar annual birth rates.

The responses from respondents representing OUs with similar annual birth rates were grouped together (group one; OUs A and B, group 2; OUs C and D, and group 3; OUs E, F and G).

5.3.1 Round two results for sections one to seven of the questionnaire

Sections one and two

With the exception of statement 1f, there was parity across the 3 OU groups regarding the statements that did and did not achieve consensus responses (Table 5-12). A higher percentage of respondents from group 3 agreed the statement 'high risk labour' was an indication for MHDC although Fisher's Exact test was not significant at the $p < 0.05$ level with an Exact probability of 0.097.

Obstetric unit (annual birth rate)		Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Group four A-G combined
Total number of respondents		25	27	22	74
		Percentage of strongly agree / agree responses calculated from the total number of respondents			
Sections 1 and 2: Please rate how strongly you agree or disagree that the conditions / events listed below are indications for maternity high dependency care (MHDC).					
1a	Hypertensive disorders	100	96.3	100	98.6
1b	Obstetric haemorrhage	96.0	96.3	100	97.3
1c	Suspected AFE	92.0	92.6	95.5	93.3
1d	Confirmed AFE	96.0	96.3	95.5	97.2
1e	Obstetric Cholestasis	24.0	40.7	36.4	33.8
1f	Acute fatty liver	76.0	85.1	95.5	85.1
1g	Gestational diabetes	24.0	33.3	36.3	31.1
2a	Low risk labour	0	0	4.5	1.4
2b	High risk labour	16.0	33.3	45.4	31.1
Section 3: Please rate how strongly you agree or disagree that the pre-existing conditions listed below are indications for MHDC.					
3a	Any co morbidity	4.0	18.5	13.6	12.2
3b	Diabetes	96.0	88.9	100	94.6
3c	Cardiac conditions	84.0	81.4	86.4	83.8
3d	Renal conditions	52.0	55.5	63.6	56.7
3e	Liver conditions	36.0	51.8	63.6	50.0
3f	Respiratory conditions	52.0	66.7	77.3	64.9
3g	Autoimmune disorders	32.0	55.5	36.4	41.9
3h	CNS disorders	12.0	33.3	36.4	27.0
3i	Haematological disorders	60.0	59.2	59.1	59.5
3j	Organ transplantation	56.0	62.9	68.2	62.1
3k	Physical disabilities	8.0	22.2	27.3	19.0
3l	Obesity	20.0	33.3	50.0	33.8
Sections 4 and 5: Please rate how strongly you agree or disagree that the complications / conditions listed below are indications for MHDC.					
4a	Suspected DVT/PE	36.0	55.5	50.0	47.3
4b	Confirmed DVT/PE	80.0	77.7	95.5	83.7
4c	Sepsis	88.0	85.1	86.4	95.9
4d	DIC	100	92.6	95.5	95.9
4e	Surgical complications	60.0	85.1	68.2	71.6
5a	Physiological deterioration / compromise	96.0	92.6	95.5	94.6
5b	Signs / symptoms of shock	96.0	100	95.5	97.3
5c	Organ dysfunction	88.0	96.3	95.5	93.3
5d	Organ failure	96.0	96.3	95.5	96.0
5e	Maternal collapse	96.0	100	86.4	94.6
Section 6: Please rate how strongly you agree or disagree that the clinical circumstances would lead you to classify a woman as requiring MHDC.					
6a	Fetal loss e.g. intrauterine death	8.0	25.9	22.7	18.9
6b	Mental illness	16.0	25.9	27.3	23.0
6c	Puerperal psychosis	48.0	51.8	59.1	52.7
6d	Domestic violence	4.0	18.5	22.7	14.9
Section 7: Please rate how strongly you agree or disagree that the following clinical scenarios would lead you to classify a woman as requiring maternity high dependency care					
7a	Any deviation from 'normal' progress that places the woman 'at risk'	28.0	25.9	31.8	28.4
7b	A woman who is considered to be at a 'high risk' of her condition deteriorating.	44.0	59.2	68.2	56.7
7c	There are serious concerns about maternal health.	56.0	74.1	81.8	70.2
7d	Any condition or complication that has the potential to threaten the life of the woman	72.0	77.7	77.2	75.7
7e	Any condition or complication that threatens the life of the woman	84.0	88.9	95.4	89.2
7f	Any condition / complication that is life threatening / potentially life threatening for the fetus	56.0	66.6	81.8	67.6
7g	A woman who is critically ill	92.0	100	86.4	93.3

Table 5-12 Delphi survey round two results for sections one to seven grouped by OUs with similar birth rates.

Sections three, four and five

There was parity across the three OU groups in terms of the statements in section three of the questionnaire that achieved or did not achieve consensus responses (Table 5-12). Respondents across all of the OU groups achieved consensus that unstable diabetes and cardiac conditions were indications for MHDC. With the exception of statements 4b and 4e, there was also parity across the three groups of respondents in terms of the statements that achieved or did not achieve consensus responses in section four of the questionnaire. In contrast to the other OU groups, the respondents of OU group two did not achieve consensus for statement 4b (77.7% SA/A) but did achieve consensus for statement 4e (85.1% SA/A).

Sections six and seven

There were no SA/A consensus responses for the emotional / psychosocial statements across any of the OU groups although consensus disagreement was apparent for some statements (Table 5-12). Only the respondents of group 3 achieved consensus responses for statements 7c and 7f and overall, this OU group recorded the most consensus responses (n=4) for this section of the questionnaire compared with the other 2 groups.

5.3.2 Round two results for sections eight and nine

Section eight

For statements 8a-8f inclusive, there was relative parity across the 3 groups in terms of the statements that achieved and did not achieve consensus responses (Table 5-13). Only the respondents representing group 1 did not gain consensus that monitoring fluid balance was a feature of MHDC whilst only group 2 respondents did not gain consensus that invasive monitoring by arterial line was a feature of MHDC. Only the respondents of group 1 agreed that Swan Ganz monitoring was a feature of MHDC

whilst the respondents of group 3 achieved consensus that the use of EWS were a feature of MHDC.

Obstetric Unit (Annual birth rate)		Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Units A-G
Total number of respondents		25	27	22	74
		Percentage of strongly agree / agree responses calculated from total number respondents			
Section 8: In relation to the observation and monitoring of women, please rate how strongly you agree or disagree that the statements below represent features of maternity high dependency care.					
8a	Vital signs < 4hrly but > or = hourly	36.0	48.1	36.4	40.6
8b	Vital signs < hourly	80.0	88.9	90.9	86.5
8c	Continuous monitoring vital signs	92.0	88.9	90.9	90.6
8d	Non-invasive monitoring e.g. BP, respiratory rate	54.0	70.4	59.1	60.8
8e	Continuous ECG	88.0	85.2	86.4	86.4
8f	Level of consciousness	80.0	92.5	86.4	86.4
8g	Fluid balance	68.0	85.2	86.4	79.7
8h	Observe blood loss	48.0	55.5	68.2	56.7
8i	Invasive monitoring i.e. CVP	84.0	80.8	86.4	82.4
8j	Invasive monitoring arterial line	92.0	70.4	86.4	82.5
8k	Swan Ganz monitoring	80.0	66.7	63.6	70.3
8l	Use of early warning systems	48.0	62.9	81.8	63.5
Section 9: Please rate how strongly you agree or disagree that the statements below are indicators of maternity high dependency care					
9a	One to one care (one trained member of staff provides care for one patient)	60.0	62.9	63.6	62.1
9b	At least one trained member of staff per 2 patients	24.0	33.3	31.8	29.7
9c	Constant attendance of a trained member of staff	92.0	66.6	72.8	77.0
9d	Regular and formal medical reviews, minimum of 4 – 6 hourly	76.0	81.4	72.8	77.0
9e	Informal medical reviews in addition to formal reviews	60.0	74.1	59.1	64.9
9f	Lead clinician - Consultant obstetrician	60.0	62.9	77.3	66.2
9g	Lead clinician - Consultant anaesthetist	56.0	74.0	86.4	71.6
9h	Joint lead clinicians - Consultant anaesthetist and obstetrician	76.0	85.1	95.5	85.1
9i	Regular and frequent clinical investigations	80.0	85.1	90.9	85.1
9j	Increased use of imaging (e.g. X-rays, ultrasound scanning)	48.0	62.9	63.6	58.1
9k	Recording of observations on high dependency/ intensive care charts	92.0	88.8	95.5	91.9
9l	Use of electronic high dependency charts	56.0	66.6	86.4	68.9

Table 5-13 Delphi survey round two results for questionnaire sections eight and nine grouped by OUs with similar birth rates.

Section nine

There were 5 statements in this section (9c, d, g, h and l) where differences of opinions occurred in terms of the OU groups achieving (or not achieving) consensus (Table 5-13). The majority of these statements were carried over into the third round for further exploration.

5.3.3 Round two results for section ten

Obstetric Unit (Annual birth rate)		Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Unit A-G
Total number of respondents		25	27	22	74
		Percentage of strongly agree / agree responses calculated from the total number of respondents			
Section 10: Please rate how strongly you agree or disagree that the interventions listed below are components of maternity high dependency care.					
10a	Step down care post ICU/CCU	96.0	96.3	86.4	93.3
10b	Immediate post-operative care	40.0	55.5	45.5	47.3
10c	Routine post op care up to 24 hours post LSCS	8.0	14.8	9.0	10.8
10d	Prolonged post-operative care > 24 hours	52.0	77.8	86.4	71.6
10e	Devising a structured plan of care that is reviewed and updated regularly	64.0	51.8	59.1	58.1
10f	Frequent treatment episodes - hourly or more frequently	84.0	74.1	59.1	73.0
10g	Referral to specialist medical staff as required	72.0	81.5	72.7	75.7
10h	Referral to paramedical staff	44.0	44.4	36.4	41.9
10i	Referral to nurses (excluding critical care nurses)	44.0	37.0	40.9	40.5
10j	Involvement of critical care outreach team	92.0	85.2	95.5	90.6
10k	Transfer of the patient (e.g. to ICU / CCU)	84.0	92.6	95.5	90.5
10l	Administration of IV anticonvulsants	92.0	88.9	100	93.2
10m	Administration of IV antihypertensive	92.0	85.1	90.9	89.2
10n	Administration of IV oxytocics	16.0	29.6	36.4	27.0
10o	Administration of inotropes / vasopressors	80.0	92.6	86.4	86.5
10p	Administration of IV fluids / blood products	44.0	44.4	36.4	41.9
10q	Administration of insulin infusion	44.0	51.8	59.1	51.3
10r	Administration of tocolytics	24.0	40.7	40.9	35.1
10s	Drugs / fluids administered via a central line	84.0	92.6	86.4	87.8
10t	Continuous oxygen therapy (e.g. > 50% given by face mask)	64.0	77.7	77.2	72.9
10u	Continuous oxygen therapy < 50% given by face mask	56.0	66.6	63.6	62.2
10v	Epidural anaesthesia administered for pain relief during labour	20.0	33.3	36.4	29.7
10w	Epidural anaesthesia, excluding pain relief during labour (e.g. postnatal analgesia)	28.0	33.3	27.2	29.7
10x	Non invasive ventilation e.g. CPAP or BIPAP	80.0	77.7	77.3	78.4
10y	Intubation and ventilation	80.0	85.2	68.1	78.4
10z	Renal support	76.0	88.9	68.1	80.5
10zi	Routine postnatal care	28.0	33.3	9.0	24.3
10zii	Thromboprophylaxis	40.0	37.0	13.6	31.1
10ziii	Pressure area care	56.0	37.0	27.2	40.5
10ziv	Care of the neonate (where applicable)	40.0	40.7	22.7	35.1
10zv	Monitoring of the pregnancy or labour (fetal monitoring, USS)	44.0	37.0	13.6	32.4
10zvi	Patient support (psychological) and advice	40.0	48.1	27.3	39.2
10zvii	Support for the woman's family	48.0	51.8	31.8	44.6

Table 5-14 Delphi survey round two results for section ten of the questionnaire grouped by OUs with similar birth rates.

Section 10 of the questionnaire consisted of 33 statements (Table 5-14) and corresponded to the round one theme of interventions. There were only 6 statements (10d, f, g, x, y, and z) where differences of opinions in terms of respondents achieving (or not achieving) consensus across the 3 OU groups occurred.

5.3.4 Round two results for section eleven (parts a and b)

Section eleven (part a)

MHDC was described as an interim level of care between normal and intensive care by the respondents representing groups one and two (Table 5-15). Consensus for this statement was also almost achieved by group three. Only the respondents of group one achieved a consensus that MHDC was 'specialist care that is not intensive care'. None of the groups achieved consensus that MHDC is the same care as is offered in ICU. Less than 50% of the respondents representing the three OU groups were familiar with the ICS levels of critical care for adults

Obstetric Unit (Annual birth rate)		Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Units A-G
Total number of respondents		25	27	22	74
Section 11a: Please rate how strongly you agree or disagree that the following statements describe MHDC:					
Percentage of strongly agree / agree responses calculated from the total number of respondents					
11a	Care that falls outside normal maternity care	56.0	48.1	36.4	47.3
11b	Interim level of care between normal and intensive care	92.0	81.5	77.3	83.8
11c	Specialist care that is not intensive care	88.0	74.1	68.2	77.0
11d	Same care as is offered in ICU.	24.0	44.4	45.4	37.8

Table 5-15 Delphi survey round two results for section eleven (part a) grouped by OUs with similar birth rates.

Section eleven (part b)

Familiarity with the ICS levels of care ranged from 22.7% to 42.4% familiarity across the groups (Table 5-16). Only the respondents representing group 3 agreed MHDC could be described as level 1 care. There was unanimous agreement across the three

groups that MHDC equated with level 2 care. None of the groups achieved consensus that MHDC equated with level 3 care.

Obstetric Unit (Annual birth rate)	Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Unit A-G
Number of responses	25	26 and 1 missing	22	73 and 1 missing response
Round 2 question 11 (section b) Are you familiar with the ICS levels of critical care for adults?	Yes 36.0% (n=9)	Yes 42.4% (n=11)	Yes 22.7% (n=5)	Yes 33.8% (n=25)
	No 64.0% (n=16)	No 55.6 % (n=15)	No 77.3% (n=17)	No 66.6% (n=48)
Please rate how strongly you agree or disagree that the following statements describe MHDC:	SA/A % responses for respondents replying 'yes'			
Level 1 care as defined by the Intensive Care Society in 2009 (e.g. patient requiring a minimum of 4 hourly observations, demonstrating abnormal vital signs but not needing a higher level of critical care)	66.7	18.2	80	76.0
Level 2 care as defined by the intensive Care Society in 2009 (e.g. extended postoperative care, a minimum of hourly observations, patients who are having a single organ system supported)	100	100	80	96.0
Level 3 care as defined by the Intensive Care Society in 2009 (e.g. patients with 2 or more organs being supported)	55.6	45.5	40	48.0

Table 5-16 Delphi survey round two results for section eleven (part b) examining respondents' knowledge of the ICS levels of critical care for adults (grouped by OUs with similar birth rates).

5.4. Round two results analysed by professional groups working in Obstetric Units with similar birth rates

No clear trends emerged when the second round data were analysed by professional groups working in OUs with similar annual birth rates for sections 1-10 of the questionnaire. As a consequence, the results for each these sections are presented for reference, but no additional commentary has been made.

5.4.1 Round two results for sections one to seven

Table 5-17 overleaf reports the results for sections 1-7 of the second round questionnaire, Table 5-18, p 185 (sections 8-9), and Table 5-19, p186 (section 10).

Obstetric Unit (Annual birth rate)		Group one A and B 3300/3300		Group two C and D 4000/45000		Group three E, F and G 1700/2200/1500		A-G combined	
Professional group (DR=Doctor, MW = Midwife)		DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents		12	13	15	12	10	12	37	37
Percentage strongly agree/ agree responses									
Sections 1 and 2: Please rate how strongly you agree or disagree that the conditions / events listed below are indications for MHDC									
1a	Hypertensive disorders	100	100	93.3	100	100	100	97.3	100
1b	Obstetric haemorrhage	91.7	100	93.3	100	100	100	94.6	100
1c	Suspected AFE	91.7	92.3	93.3	91.7	100	91.7	94.6	91.9
1d	Confirmed AFE	100	92.3	100	91.7	100	100	97.3	94.6
1e	Obstetric Cholestasis	25.0	23.1	20	66.7	20.0	50.0	21.6	45.9
1f	Acute fatty liver	75.0	77.0	80.0	91.7	100	91.7	83.8	86.5
1g	Gestational diabetes	25.0	23.1	20.0	50.0	30.0	41.7	24.3	37.8
2a	Low risk labour	0	0	0	0	10.0	0	2.7	0
2b	High risk labour	16.7	15.4	20.0	50.0	40.0	50.0	24.3	37.8
Section 3: Please rate how strongly you agree or disagree that the pre-existing conditions listed below are indications for MHDC.									
3a	Any co morbidity	0	7.7	13.3	25.0	0	25.0	5.4	18.9
3b	Unstable diabetes	91.7	100	80.0	80.0	100	100	89.2	100
3c	Cardiac conditions	83.4	84.6	80.0	83.3	80.0	91.7	81.0	86.4
3d	Renal conditions	41.7	61.5	46.6	66.6	60.0	66.7	48.6	64.8
3e	Liver conditions	33.3	38.5	33.3	75.0	60.0	66.7	40.5	59.4
3f	Respiratory conditions	58.3	46.2	86.7	66.7	100	58.3	73.0	56.7
3g	Autoimmune disorders	33.3	30.8	40.0	75.0	20.0	50.0	32.4	51.3
3h	CNS disorders	16.7	7.7	13.3	58.3	40.0	33.3	21.6	32.4
3i	Haematological disorders	58.3	61.5	46.7	75.0	50.0	66.7	51.3	67.6
3j	Organ transplantation	41.7	69.2	46.7	83.3	50.0	83.3	45.9	78.3
3k	Physical disabilities	0	15.4	13.3	33.3	20.0	33.3	10.8	27.0
3l	Obesity	8.3	30.8	26.7	41.7	40.0	58.3	24.3	43.2
Sections 4 and 5: Please rate how strongly you agree or disagree that the complications / conditions are indications for MHDC.									
4a	Suspected DVT/PE	33.3	38.5	40.0	75.0	50.0	50.0	40.5	54.0
4b	Confirmed DVT/PE	75.0	84.6	73.3	83.3	90.0	100	78.3	89.1
4c	Sepsis	91.7	84.6	80.0	91.7	90.0	83.3	86.4	86.5
4d	DIC	100	100	93.3	91.7	100	91.7	97.3	94.6
4e	Surgical complications	41.7	76.9	73.3	100	90.0	50.0	67.5	75.6
5a	Physiological compromise	91.7	100	93.3	91.7	100	91.7	94.6	94.6
5b	Signs / symptoms of shock	91.7	100	100	100	100	91.7	97.3	97.3
5c	Organ dysfunction	83.3	92.3	100	91.7	100	91.7	94.6	91.9
5d	Organ failure	91.7	100	100	91.7	100	91.7	97.3	94.6
5e	Maternal collapse	91.7	100	100	100	90.0	83.3	94.6	94.6
Section 6: Please rate how strongly you agree / disagree that the clinical circumstances would lead you to classify a woman as requiring MHDC.									
6a	Fetal loss e.g. intrauterine death	0	15.4	13.3	41.7	0	41.7	5.4	32.4
6b	Mental illness	0	30.8	13.3	41.7	10.0	41.7	8.1	37.8
6c	Puerperal psychosis	41.7	53.8	46.7	58.3	30.0	83.3	40.5	64.8
6d	Domestic violence	0	7.7	6.7	33.3	0	41.7	2.7	27.0
Section 7: Please rate how strongly you agree or disagree that the following clinical scenarios would lead you to classify a woman as requiring MHDC									
7a	Any deviation from 'normal' progress that places the woman 'at risk'	25.0	30.8	13.3	41.7	20.0	41.7	18.9	37.8
7b	A woman who is considered to be at a 'high risk' of her condition deteriorating.	33.4	53.8	53.3	66.7	70.0	66.7	51.3	62.1
7c	There are serious concerns about maternal health.	50.0	61.5	60.0	91.7	90.0	75.0	64.8	75.6
7d	Any condition or complication that has the potential to threaten the life of the woman	83.3	61.5	66.6	91.7	90.0	66.7	78.4	72.9
7e	Any condition or complication that threatens the life of the woman	83.3	84.6	80.0	100	100	91.7	86.4	91.9
7f	Any condition / complication that is life threatening / potentially life threatening for the fetus	66.7	46.2	53.3	83.3	70.0	91.7	62.1	72.9
7g	A woman who is critically ill	91.7	92.3	100	100	80.0	91.7	91.9	94.6

Table 5-17 Delphi survey round two results for sections one to seven, analysed by professional groups from OUs with similar birth rates.

5.4.2 Round two results for sections eight and nine

Obstetric Unit (Annual birth rate)		Group one A and B (3300 / 3300)		Group two C and D (4000/4500)		Group three E, F and G (1700/2200/1500)		Obstetric Units A-G	
Professional group DR=Doctor MW = Midwife		DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents		12	13	15	12	10	12	37	37
Percentage strongly agree/ agree responses									
Section 8: In relation to the observation and monitoring of women, please rate how strongly you agree or disagree that the statements below represent features of maternity high dependency care.									
8a	Vital signs < 4hrly but > or = hourly	50.0	23.1	46.7	50.0	20.0	50.0	40.5	40.5
8b	Vital signs < hourly	83.3	76.9	86.7	91.7	90.0	91.7	86.4	86.4
8c	Continuous monitoring vital signs	83.3	100	86.7	91.7	90.0	91.7	86.4	94.6
8d	Non invasive monitoring e.g. BP, respiratory rate	58.3	46.2	80.0	58.3	60.0	58.3	67.5	54.0
8e	Continuous ECG	83.3	92.3	80.0	91.7	90.0	83.3	83.8	89.2
8f	Level of consciousness	66.7	92.3	86.7	100	90.0	83.3	81.0	91.9
8g	Fluid balance	66.7	69.2	93.3	75.0	90.0	83.3	83.7	75.6
8h	Observe blood loss	58.3	38.5	60.0	50.0	80.0	58.3	64.8	48.6
8i	Invasive monitoring i.e. CVP	86.7	100	66.7	91.7	90.0	83.3	72.9	91.9
8j	Invasive monitoring arterial line	66.7	100	53.3	91.7	80.0	91.7	70.2	94.6
8k	Swan Ganz monitoring	58.3	100	46.6	91.7	40.0	83.3	48.6	91.9
8l	Use of early warning systems (e.g. MEWS, MEOWS, Patient at Risk (PAR) scoring)	33.3	61.5	60.0	66.7	80.0	83.3	56.7	70.2
Section 9: Please rate how strongly you agree or disagree that the statements below are indicators of maternity high dependency care									
9a	One to one care (one trained member of staff provides care for one patient)	66.7	53.8	80.0	41.7	80.0	50.0	75.7	48.6
9b	At least one trained member of staff per 2 patients	41.7	7.7	46.7	16.7	40.0	25.0	43.2	16.2
9c	Constant attendance of a trained member of staff	91.7	92.3	73.3	58.3	80.0	66.7	81.0	72.9
9d	Regular and formal medical reviews, minimum of 4 – 6 hourly	83.3	69.2	93.3	66.7	80.0	66.7	86.4	67.5
9e	Informal medical reviews in addition to formal reviews	58.3	61.6	86.7	58.3	70.0	50.0	72.9	56.7
9f	Lead clinician - Consultant obstetrician	58.3	61.6	66.7	58.3	80.0	75.0	67.5	64.8
9g	Lead clinician - Consultant anaesthetist	58.3	53.8	73.3	75.0	90.0	83.3	72.9	70.2
9h	Joint lead clinicians – Consultant anaesthetist and consultant obstetrician	75.0	76.9	86.7	83.3	90.0	100	83.7	86.4
9i	Regular and frequent clinical investigations	66.7	92.3	80.0	91.7	90.0	91.7	78.4	91.9
9j	Increased use of imaging (e.g. X-rays, ultrasound scanning)	25.0	69.2	66.7	58.3	50.0	75.0	48.6	67.5
9k	Recording of observations on high dependency/ intensive care charts	83.3	100	93.3	83.3	90.0	100	89.1	94.6
9l	Use of electronic high dependency charts	50.0	61.5	60.0	75.5	90.0	83.3	64.8	72.9

Table 5-18 Delphi survey round two results for sections eight and nine, analysed by professional groups from OUs with similar birth rates.

5.4.3 Round two results for section ten

Obstetric Unit (Annual birth rate)		Group one A and B 3300/3300		Group two C and D 4000/4500		Group three E, F and G 1700/2220/1500		A-G combined	
Professional group (DR=Doctor, MW = Midwife)		DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents		12	13	15	12	10	12	37	37
		Percentage strongly agree/ agree responses							
Section 10: Please rate how strongly you agree or disagree that the interventions listed below are components of maternity high dependency care.									
10a	Step down care post ICU/CCU	91.7	100	100	91.7	70.0	100	89.2	97.3
10b	Immediate post-operative care	25.0	53.8	53.3	58.3	60.0	33.3	45.9	48.6
10c	Routine post op care up to 24 hours post LSCS	8.3	7.7	13.3	16.7	10.0	8.3	10.8	10.8
10d	Prolonged post-operative care > 24 hours	83.3	61.5	80.0	75.0	70.0	100	64.9	78.4
10e	Devising a structured plan of care that is reviewed and updated regularly	75.0	53.8	60.0	41.7	70.0	50.0	67.6	48.6
10f	Frequent treatment episodes - hourly or more frequently	75.0	92.3	73.3	75.0	40.0	75.0	64.9	81.1
10g	Referral to specialist medical staff as required	58.3	84.6	73.3	91.7	70.0	75.0	67.6	83.8
10h	Referral to paramedical staff	41.6	46.2	53.3	33.3	40.0	33.3	45.9	37.8
10i	Referral to nurses (excluding critical care nurses)	41.6	46.2	40.0	33.3	30.0	50.0	37.8	43.2
10j	Involvement of critical care outreach team	91.7	92.3	86.7	83.3	90.0	100	89.2	91.9
10k	Transfer of the patient (e.g. to ICU / CCU)	83.3	84.6	86.7	100	100	91.7	89.1	91.9
10l	Administration of IV anticonvulsants	83.3	100	80.0	100	100	100	86.5	100
10m	Administration of IV antihypertensive	83.3	100	80.0	91.7	90.0	91.7	83.8	94.6
10n	Administration of IV oxytocics	8.3	23.1	20.0	41.7	30.0	41.7	18.9	35.1
10o	Administration of inotropes / vasopressors	75.0	84.6	100	83.3	80.0	91.7	86.5	86.5
10p	Administration of IV fluids / blood products	41.6	46.2	26.7	66.7	40.0	33.3	35.1	48.6
10q	Administration of insulin infusion	41.6	46.2	26.7	83.3	50.0	66.7	37.8	64.9
10r	Administration of tocolytics	16.7	30.8	13.3	75.0	30.0	50.0	18.9	51.3
10s	Drugs / fluids administered via a central line	66.7	100	93.3	91.7	90.0	83.3	83.7	91.9
10t	Continuous oxygen therapy (e.g. > 50% given by face mask)	41.6	84.6	66.7	91.7	80.0	75.0	62.1	83.7
10u	Continuous oxygen therapy < 50% given by face mask	41.6	69.3	53.3	83.3	60.0	66.7	51.3	72.9
10v	Epidural anaesthesia administered for pain relief during labour	25.0	15.4	26.7	41.7	30.0	41.7	27.0	32.4
10w	Epidural anaesthesia, excluding pain relief during labour (e.g. post natal analgesia)	25.0	30.8	26.7	41.7	10.0	41.7	21.6	37.8
10x	Non invasive ventilation e.g. CPAP or BIPAP	66.7	92.3	80	75.0	80.0	75.0	75.6	81.1
10y	Intubation and ventilation	58.3	100	86.7	83.3	70.0	66.7	73.0	83.8
10z	Renal support	58.3	92.3	86.7	91.7	70.0	66.7	72.9	83.8
10zi	Routine postnatal care	25.0	30.8	26.7	41.7	20.0	0	24.3	24.3
10zii	Thromboprophylaxis	41.6	38.5	33.3	41.7	30.0	0	35.1	27.0
10ziii	Pressure area care	50.0	61.5	26.7	50.0	50.0	8.3	40.5	40.5
10ziv	Care of the neonate (where applicable)	33.3	46.2	33.3	50.0	30.0	16.7	32.4	37.8
10zv	Monitoring of the pregnancy or labour (fetal monitoring, USS)	25.0	61.5	26.7	50.0	30.0	0	27.0	37.8
10zvi	Patient support (psychological) and advice	25.0	53.9	46.7	50.0	40.0	16.7	37.8	40.5
10zvii	Support for the woman's family	33.3	61.5	46.7	58.3	50.0	16.7	43.2	45.9

Table 5-19 Delphi survey round two results for section ten analysed by professional groups from OUs with similar birth rates.

5.4.4 Round two results for section eleven (parts a and b)

Section eleven (part a)

The majority of respondents agreed that MHDC was an interim level of care between normal and intensive care except the doctors of group 2 and the midwives of group 3 (Table 5-20).

Obstetric Unit (Annual birth rate)		Group one A and B 3300/3300		Group two C and D 4000/4500		Group three E, F and G 1700/2220/1500		A-G combined	
Professional group (DR=Doctor, MW = Midwife)		DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents		12	13	15	12	10	12	37	37
		Percentage strongly agree/ agree responses							
Section 11a: Please rate how strongly you agree or disagree that the following statements describe MHDC:									
11a	Care that falls outside normal maternity care	58.3	53.9	53.3	41.7	30.0	41.7	48.6	45.9
11b	Interim level of care between normal and intensive care	83.3	100	73.3	91.7	90.0	66.7	81.1	86.5
11c	Specialist care that is not intensive care	91.7	84.6	60.0	91.7	60.0	75.0	70.2	83.8
11d	Same care as is offered in ICU	8.3	38.5	40.0	50.0	30.0	58.3	27.0	48.6

Table 5-20 Delphi survey round two results for section eleven (a) analysed by professional groups from OUs with similar birth rates

Section eleven (part b)

More doctors were familiar with the ICS levels of critical care for adults than midwives (Table 5-21). For those who were familiar, there was consensus that 'level 2' care described MHDC. There was also a borderline consensus that 'level 1' care described MHDC.

Obstetric Unit (Annual birth rate)		Group one A and B 3300/3300		Group two C and D 4000/4500		Group three E, F and G 1700/2220/1500		A-G combined	
Professional group DR=Doctor, MW=Midwife		DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents		12	13	15	12	10	12	37	37
Round 2 question 11 (section b)									
Familiar with the ICS levels of critical care for adults		50.0% (n=6)	23.1% (n=3)	53.3% (n=8)	25.0% (n=3)	30.0% (n=3)	16.7% (n=2)	45.9% (n=17)	21.6% (n=8)
Unfamiliar with the ICS levels of critical care for adults		50.0% (n=6)	76.9% (n=10)	46.7% (n=7)	66.7% (n=8)	70.0% (n=7)	83.3% (n=10)	54.1% (n=20)	75.7% (n=28)
Missing response for question		0%	0%	0%	8.3% (n=1)	0%	0	0%	2.7% (n=1)
Please rate how strongly you agree or disagree that the following statements describe MHDC:		Percentage of SA/A responses for respondents replying 'yes' to question 11b							
Level 1 care as defined by the Intensive Care Society in 2009		66.% (n=4)	66.7% (n=2)	87.5% (n=7)	0%	66.7% (n=2)	100% (n=2)	76.5% (n=13)	75.0% (n=6)
Level 2 care as defined by the intensive Care Society in 2009		100% (n=6)	100% (n=3)	100% (n=8)	100% (n=3)	100% (n=3)	50.0% (n=1)	100% (n=17)	87.5% (n=7)
Level 3 care as defined by the Intensive Care Society in 2009 (e.g. patients with 2 or more organs being supported)		50.0% (n=3)	66.7% (n=2)	50.0% (n=4)	33.3% (n=1)	33.3% (n=1)	50.0% (n=2)	47% (n=8)	50.0 (n=4)

Table 5-21 Delphi survey round two results for section eleven (b) analysed by professional groups from OUs with similar birth rates.

5.5 Development of the round three questionnaire

A single statement with a median score of 1 was removed from the round 2 questionnaires (question 2a), and 10 statements scoring medians of 2 were removed (questions 3k, 6a, 6d, 9b, 10c, 10v, 10zi, 10zii, 10ziv, 10zv). A total of 22 statements had median scores of 5 in round 2. Six of the statements with medians of 5 were not included in the round 3 questionnaire (questions 5e, 7e, 8c, 9k, 10k, 10l) as consensus was achieved and there were no qualitative comments indicating the need for further investigation.

In response to the second round qualitative comments provided by the respondents, 16 statements with medians of 5 were included separately or as combined statements in section one of the third round questionnaire asking, 'should patients with the following conditions or interventions be cared for on an ICU?'

Of the round two statements scoring medians of 4 (n= 45) and those with medians of 4.5 (n=1), 1 statement was not included in round 3 as a consensus was achieved (question 8b) and no further exploration was deemed necessary. A total of 15 round 2 statements achieved a consensus (questions 3b, 3c, 4b, 4c, 8e, 8f, 8g, 9h, 9i, 10a,10j,10m,10o, 10x,11b) but were reworded and / or combined and reintroduced into round 3 in response to the qualitative comments received from the participants. This approach enabled the researcher to build a more precise picture of what constituted MHDC.

In total 4 of the 15 round 2 statements with medians of 4 that achieved consensus were included in section 1 of the third round questionnaire exploring the need for intensive care. Thirty statements scored medians of 4 but did not achieve the 80% level of consensus and 27 of these were reintroduced into round 3 taking into consideration the

qualitative comments provided by the respondents and demonstrating the researcher's responsiveness to the qualitative feedback. Three of the 30 round 2 statements with medians of 4 that did not achieve a consensus were removed (9l, 10e, 10f). Statement 9l (the use of electronic record charts) was removed as the respondent highlighted that these charts were not available in many OUs. The round 2 statements 10e (structured and regularly updated care plan) and 10f (frequent treatment episodes) were removed as they were non-specific and included in more explicit round 3 questions. A summary of the second round statements that were removed, reworded or, reintroduced into the third round are detailed in Appendix 6 (Table A6-1).

5.6 Synopsis

This chapter has presented the results of the Delphi second round. These findings were used to inform the development of the third and final round questionnaire, as described in sections 3.3.5.7 and 5.5. The results of the third round questionnaire are presented in chapter 6.

Chapter 6 Results of Delphi Survey (Round Three)

6.0 Introduction

This chapter reports the findings of the third round of the Delphi survey. Results are presented in the following order:

- 1) For the whole respondent group.
- 2) For respondents representing OU groups with similar birth rates.
- 3) By the professional groups of doctors and midwives working in OU groups with similar birth rates.

6.1 Round three response rates

During round 3, n=74 questionnaires were distributed and n=67 were returned giving an attrition rate of 9.5% between the second and third rounds. All of the professional titles continued to be represented during the third round of the survey and a detailed breakdown is shown in Appendix 10 (Table A10-4). A summary of the response rates achieved over the three survey rounds is presented in Figure 6-1.

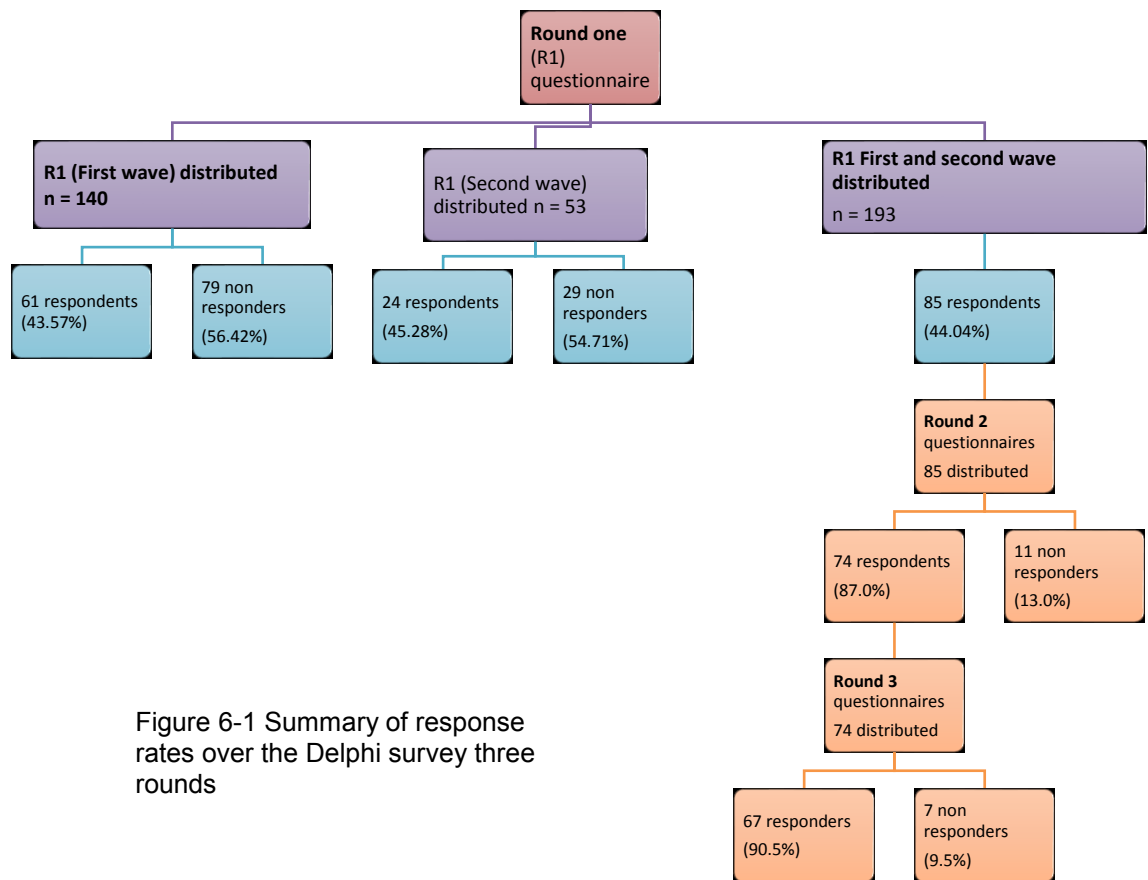


Figure 6-1 Summary of response rates over the Delphi survey three rounds

6.2 Round three results for all of the Obstetric Units combined

6.2.1 Round three results, section one (question one)

Section 1 of the questionnaire asked the respondents if intensive care or MHDC was required for specific conditions, types of monitoring and interventions (Table 6-1). Of the 15 statements, n=8 achieved $\geq 80\%$ 'yes' responses in favour of intensive care. Respondents' comments identified that women with confirmed AFE or DIC may be suitable for MHDC but this would depend on the clinical monitoring and interventions that were required.

Severe obstetric conditions and suspected AFE did not achieve consensus responses. The 20 respondents who provided additional comments suggested that admission to

ICU would be influenced by the severity of a woman's condition and her physiological stability. Adequate midwifery staffing also influenced the decision to escalate a woman's care away from the OU.

"In the current climate there are not enough midwives to give "normal" care – women should have specialist care" (D31, Yes).

The respondents had mixed opinions as to whether women requiring continuous ECG monitoring, neurological observations and arterial monitoring were suitable for MHDC. Comments suggested the underlying condition necessitating the monitoring would influence their decisions, as would the availability of midwives able to provide the requisite care and those with nursing qualifications. The administration of drugs and / or fluids administered via a central line also generated a large number of comments raising the same issues.

Section 1. Question 1. Patients with the following conditions or interventions should be cared for on an ICU:	Yes response %	No response %	Missing responses %	Comments
Severe obstetric conditions	61.2	35.8	3.0	<i>Dependent on severity of condition – HDU care can be provided in mat unit if HDU training provided, maintained as competent and appropriately staffed for 1:1 care (B42; No) High dependency on delivery unit would be sufficient for <u>many</u> of these, if midwives have sufficient training or / and experience.” (C 41; No)</i>
Suspected amniotic fluid embolism	70.1	26.9	3.0	<i>HDU may be sufficient depending on support / symptoms (F14; Yes)</i>
Confirmed amniotic fluid embolism	92.5	4.5	3.0	<i>Stabilised within the LW setting and then transferred to ICU. (A 27; Yes)</i>
Disseminated intravascular coagulation (DIC)	89.6	7.5	3.0	<i>Depends on clinical severity (E 10; Yes)</i>
Physiological deterioration / compromise	98.5	1.5	0	<i>No comments</i>
Continuous ECG monitoring and / or neurological observations required	56.7	41.8	1.5	<i>We don't have the facility for ECG monitoring or any of those below, other units probably do. Our women would go to ITU /CCU (G 28; Yes)</i>
Invasive monitoring – arterial line	62.7	35.8	1.5	<i>Many will depend on number of experienced nurses who have become midwives. (A 27; blank response with comment)</i>
Invasive monitoring – pulmonary artery flotation catheter (Swan Ganz lines)	91.0	9.0	0	<i>In our unit no Labour Ward HDU (F 2; Yes)</i>
Administration of inotropes / vasopressors (e.g. dopamine)	86.6	9.0	4.5	<i>Again not sure – could this be done by senior midwife? (D 31; No)</i>
Drugs and / or fluids administered via a central line	46.3	53.7	0	<i>Must be monitored v. closely – if there are not the levels of appropriately experienced staff then should be elsewhere (D 31; No)</i>
Continuous oxygen therapy (e.g. > 50% given by face mask)	55.2	44.8	0	<i>Not always, can be managed with rebreathe bag in clinical area (D 1; No) ? ITU (E 7)</i>
Continuous oxygen therapy (e.g. < 50% given by face mask)	16.4	82.1	1.5	<i>Not sure (B 5; missing response)</i>
Non invasive ventilation e.g. CPAP or BIPAP	86.6	11.9	1.5	<i>Usually (T 35; Yes)</i>
Intubation and ventilation	98.5	1.5	0	<i>No comments</i>
Renal support	94.0	4.5	1.5	<i>If dialysis or haemoperfusion (B 10; Yes)</i>

Table 6-1 Delphi survey round three results for section one (question one), for all respondents comb

6.2.2 Round three results for section two (question one)

Of the 14 clinical scenarios presented to the respondents in this section of the questionnaire, 6 achieved consensus responses in favour of MHDC whilst 1 achieved a borderline consensus (Table 6-2). Some respondents suggested that intensive care might be required for a woman with severe sepsis or acute surgical complications but this would depend on her level of physiological stability.

Severe pre-existing conditions with clinical stability, morbid obesity and organ transplantation scored medians of 3 and respondents identified again that clinical stability was a key factor in their decision whether to provide MHDC. Comments regarding morbid obesity suggested the need for MHDC would be dependent on a woman's general health, her pregnancy history and whether difficulties relating to the monitoring of the fetal / maternal condition were encountered as a direct consequence of the condition. The commonality of the condition was also commented upon.

Section 2. Question 1. The following clinical scenarios are indications for MHDC:	Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
Clinical instability due to a pre existing condition(s)	4 (1)	92.5	3.0	4.5	0	No comments
Confirmed PE	4 (1)	92.5	4.5	3.0	0	<i>Would depend on the clinical effects (F 33; neither agree nor disagree).</i>
Serious concerns regarding maternal health, e.g. a woman may be at high risk of deteriorating or has a condition with life threatening potential.	4 (1)	91.1	4.5	4.5	0	<i>"Not an appropriate environment for this" (D1; strongly disagree)</i>
Severe sepsis e.g. septicaemia	5 (1)	86.6	9.0	3.0	1.5	<i>ICU (C 18; strongly disagree) ICU (D24; strongly agree)</i>
Acute surgical complication e.g. peritonitis / bowel obstruction	5 (1)	85.0	9.0	6.0	0	<i>May need ICU (B 35; strongly agree) Depends on stability (G8; agree)</i>
'Step down care' required post ICU or CCU admission	4 (1)	83.6	0	16.4	0	<i>Useful but not necessary. (E 10; neither agree nor disagree) Unsure what 'step down care' is (D 51; neither agree nor disagree)</i>
A woman receiving IV anti hypertensives (e.g. labetalol)	4 (1)	79.1	7.5	11.9	1.5	<i>Not care in specialised unit – on care pathway (E 77; disagree)</i>
Autoimmune disorder / central nervous system disorder where woman is clinically unstable	4 (1)	74.6	7.5	14.9	3.0	<i>Again if neurological disorder and unstable then yes but not normally needed for autoimmune (D1; neither agree nor disagree)</i>
Prolonged post operative care because of unsatisfactory patient recovery	4 (1)	74.6	6.0	17.9	1.5	No comments
Suspected PE	4 (1)	70.1	7.5	22.4	0	<i>Depends on clinical effects (E 10; neither agree nor disagree) If high index of suspicion by senior reg and consultant (E 77; agree)</i>
Presence of severe pre existing condition(s) (e.g. diabetes, cardiac) where the woman is clinically stable.	3 (2)	44.7	29.9	23.9	1.5	<i>It depends. A diabetic can be managed on normal room on SS, but if a cardiac condition needing O2 sats and continuous ECG in labour then needs it (D1; neither agree nor disagree)</i>
Morbid obesity	3 (2)	41.8	37.3	22.4	1.5	<i>Depends on general health / pregnancy hx etc. (A 33; neither agree nor disagree)</i>
History of organ transplantation - stable patient	3 (2)	32.8	37.3	28.4	1.5	<i>Depends on organ and general health. (A 33; neither agree nor disagree)</i>
Obstetric conditions – stable patient	2 (1)	9.0	79.1	11.9	0	<i>'Clinically stable' is the key here and in several others (A 33; disagree)</i>

Table 6-2 Delphi survey round three results for section two (question one), for all respondents combined

6.2.3 Round three results for section two (question two)

Of the 12 statements comprising this section of the questionnaire, 9 statements achieved consensus responses (Table 6-3). Although respondents agreed that women with puerperal psychosis require specialist perinatal mental health services, they also commented that these services are not readily available.

The statement regarding prolonged postoperative care did not achieve consensus and the respondents' comments highlighted variations in the organisation of care across OUs. Referral to paramedical staff scored a median of 4 but did not reach the $\geq 80\%$ consensus level. The respondents' comments highlighted their input was not specific to MHDC.

Section 2. Question 2. Please indicate how strongly you agree or disagree with the following statements	Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %	Comments
High risk labour (e.g. multiple pregnancy malpresentation) on its own, is not an indication for MHDC.	4 (1)	89.5	6.0	4.5	0	<i>As long as the patient is managed appropriately by a MW (Midwife) with experience and woman is monitored (D31; agree) These are <u>labour</u> issues not maternal morbidity issues (D1; strongly disagree)</i>
Women with puerperal psychosis need psychiatric perinatal services as opposed to MHDC.	4 (1)	89.5	3.0	7.5	0	<i>But not often available! Not a realistic choice. (F 14, neither agree nor disagree)</i>
Non invasive monitoring e.g. BP, resps, continuous ECG, level of consciousness, will be performed as part of MHDC where clinically indicated.	4 (1)	94.0	1.5	4.5	0	No comments
Monitoring of vital signs more frequently than 4 hourly but not more frequently than hourly is a feature of MHDC.	3 (2)	35.8	37.3	22.4	4.5	<i>MHDC would be more frequently than this (E 77; disagree)</i>
An early warning scoring system e.g. (MEWS, MEOWS, Patient at Risk (PAR) should be used for all women receiving MHDC.	5 (1)	89.5	1.5	9.0	0	<i>"MEOWS should be used to identify women who <u>need</u> MHDC." (C 17; disagree)</i>
One to one care (with a professional in constant attendance) is a characteristic of MHDC.	4 (1)	83.6	7.5	9.0	0	<i>But often not the case unfortunately (D 47; agree) It should be but staffing levels are not always adequate enough (D 31; neither agree nor disagree)</i>
Regular medical reviews are a characteristic of MHDC.	5 (1)	97.0	0	3.0	0	<i>But also of standard midwifery and obstetric practice. (A 11; agree)</i>
Joint lead clinicians (a consultant obstetrician and consultant anaesthetist) are a feature of MHDC.	4 (1)	98.5	1.5	0	0	<i>Plus a lead high risk midwife / or nurse (E 77; strongly agree)</i>
Regular and frequent investigations e.g. bloods, ABG, imaging are used on an individualised basis during MHDC.	4 (1)	91.0	9.0	0	0	No comments
Immediate post operative care (e.g. first hour post LSCS) does not constitute MHDC.	4 (1)	73.1	11.9	14.9	0	<i>This is a critical time for women but depends on system present. If no recovery trained staff available MHDC is appropriate – but this raises a multitude of other issues (A33; neither agree nor disagree)</i>
Referral (as required) to specialist medical staff and or the critical care outreach team / intensive care unit are components of MHDC.	4 (1)	91.0	0	9.0	0	<i>Can be (B32; strongly agree)</i>
Referral (as required) to paramedical staff e.g. physiotherapist, ODP (excluding critical care nurses) are components of MHDC.	4 (1)	65.7	16.4	17.9	0	<i>But also of standard midwifery and obstetric practice (A11; agree)</i>

Table 6-3 Delphi survey round three results for section two (question two), for all respondents combine

6.2.4 Round three results for section two (question three)

Overall, there was consensus regarding the routine medications and care that women and their families would require as part of MHDC (Table 6-4). The respondents provided limited comments for this section of the questionnaire. Epidural anaesthesia for post-natal pain relief did not achieve consensus, but no additional comments explained this finding.

Section 2. Question 3. Please indicate how strongly you agree or disagree with the following statements	Median score (IQR)	SA/A %	SD/D %	NAND %	Missing responses %
The administration of IV fluids, blood products, IV oxytocics, tocolytics and insulin are components of routine maternity care that may be also used in MHDC.	4 (1)	97	3.0	0	0
A woman needing epidural anaesthesia, excluding pain relief during labour (e.g. postnatal pain relief) will not be classed as receiving MHDC.	4 (1)	73.1	19.4	7.5	0
Routine care (e.g. pressure area care, patient / family support) will be performed as part of MHDC.	4 (1)	91	7.5	1.5	0
MHDC is more likely to be undertaken for maternal than fetal reasons.	4 (1)	86.6	1.5	11.9	0
MHDC is an interim level of care for women requiring interventions over and above the specialised 'high risk' care that will be carried out routinely on a consultant led labour ward, but not requiring care on an intensive care unit.	4 (1)	88.0	6.0	4.5	1.5
MHDC will be implemented where a patient has deteriorated clinically but her care can be managed appropriately on the labour ward.	4 (1)	89.6	6.0	1.5	0

Table 6-4 Delphi survey round three results for section two (question three), for all respondents combined.

6.3 Round three results analysed by Obstetric Units grouped with similar birth rates

6.3.1 Round three results for section one (question one)

The respondents of group three achieved consensus that women with severe obstetric conditions, suspected AFE, invasive monitoring by arterial line and the administration of drugs / fluids via a central line required intensive care as opposed to MHDC (Table 6-5). Fisher's Exact test result was significant for severe obstetric conditions (Fisher's Exact = 0.013, $p < 0.05$) but not significant for suspected AFE. Fisher's Exact test was also significant for invasive monitoring by arterial line (Fisher's Exact = 0.028, $p < 0.05$) and drugs / fluids via a CVP line (Fisher's Exact = 0.0002, $p < 0.05$). The respondents

of groups 1 and 3 agreed that women requiring non-invasive ventilation should be cared for on an ICU whilst those of group 2 did not achieve a consensus for this statement. Overall, the respondents of group 3 recorded the most statements in favour of intensive care (n=12).

Obstetric Unit (Annual Birth rate)	Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Units A-G
Total number of respondents	21	25	21	67
Section 1. Question 1. Patients with the following conditions or interventions should be cared for on an ICU:	Percentage agreement in favour of ICU care			
Severe obstetric conditions	42.9	56.0	85.7	61.2
Suspected amniotic fluid embolism	66.7	60.0	85.7	70.1
Confirmed amniotic fluid embolism	95.2	88.0	95.2	92.5
Disseminated intravascular coagulation	90.5	88.0	90.5	89.6
Physiological deterioration / compromise (unstable patient despite escalation of appropriate care)	100	96.0	100	98.5
Continuous ECG monitoring and / or neurological observations required	52.4	52.0	66.7	56.7
Invasive monitoring – arterial line	47.6	56.0	85.7	62.7
Invasive monitoring – pulmonary artery flotation catheter (Swan Ganz lines)	95.2	80.0	100	91.0
Administration of inotropes / vasopressors (e.g. dopamine)	85.7	80.0	95.2	86.6
Drugs and / or fluids administered via a central line	19.0	40.0	81.0	46.3
Continuous oxygen therapy (e.g. > 50% given by face mask)	52.4	44.0	71.4	55.2
Continuous oxygen therapy (e.g. < 50% given by face mask)	0	20.0	28.6	16.4
Non invasive ventilation e.g. CPAP or BIPAP	100	72.0	90.5	86.6
Intubation and ventilation	100	96.0	100	98.5
Renal support	100	84.0	100	94.0

Table 6-5 Delphi survey round three results for section one (question one), grouped by OUs with similar birth rates.

6.3.2 Round three results for section two (question one)

There was relative parity across the OU groups that did and did not achieve consensus for this section of the questionnaire (Table 6-6). The respondents of group 3 achieved a consensus of opinion that a woman with an autoimmune disorder / central nervous system disorder with clinical instability is an indication for MHDC whilst the other two groups did not.

Obstetric Unit (Annual birth rate)	Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	Obstetric Units A-G
Total number of respondents	21	25	21	67
Section 2. Question 1. The following clinical scenarios are indications for MHDC:	Percentage strongly agree / agree responses			
Obstetric conditions – stable patient	4.8	12.0	9.5	9.0
Clinical instability due to a pre existing condition(s) (e.g. diabetes, cardiac, renal, liver, respiratory, haematological disorders)	85.7	92.0	100	92.5
Presence of severe pre existing condition(s) (e.g. diabetes, cardiac) where the woman is clinically stable.	47.7	52.0	33.3	44.8
Autoimmune disorder / central nervous system disorder where woman is clinically unstable	61.9	72.0	90.5	74.6
History of organ transplantation - stable patient	28.6	36.0	33.3	32.8
Morbid obesity	33.3	44.0	47.6	41.8
Suspected PE	71.5	72.0	66.6	70.1
Confirmed PE	90.5	92.0	95.2	92.5
Severe sepsis e.g. septicaemia	85.7	84.0	90.5	86.6
Acute surgical complication e.g. peritonitis / bowel obstruction	95.2	80.0	80.9	85.0
'Step down care' required post ICU or CCU admission	90.5	80.0	80.9	83.6
Prolonged post operative care because of unsatisfactory patient recovery	71.4	80.0	71.4	74.6
A woman receiving IV anti hypertensives (e.g. labetalol)	90.5	72.0	76.1	79.1
Serious concerns regarding maternal health, e.g. a woman may be at high risk of deteriorating or has a condition with life threatening potential.	95.2	84.0	95.2	91.1

Table 6-6 Delphi survey round three results for section two (question one), grouped by OUs with similar birth rates.

Only the respondents of OU group 2 achieved consensus that prolonged post operative care was an indication for MHDC. In contrast, intravenous anti hypertensives were agreed to be an indication for MHDC by the respondents of group 1 only. The respondents of all 3 OU groups agreed that 'serious concern regarding maternal health' was an indication for MHDC.

6.3.3 Round three results for section two (question two)

The group 1 respondents were close to achieving consensus that 'one to one care (with a professional in constant attendance) is a characteristic of MHDC' whilst the other groups did achieve consensus (Table 6-7).

Obstetric Units (Annual birth rate)	Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	A-G combined
Total number of respondents	21	25	21	67
Section 2. Question 2. Please indicate how strongly you agree or disagree with the following statements	Percentage strongly agree / agree responses			
High risk labour (e.g. multiple pregnancy malpresentation) on its own, is not an indication for MHDC.	95.2	92.0	80.9	89.5
Women with puerperal psychosis need psychiatric perinatal services as opposed to MHDC.	80.0	96.0	90.5	89.5
Non invasive monitoring e.g. BP, resps, continuous ECG, level of consciousness, will be performed as part of MHDC where clinically indicated.	95.2	96.0	90.5	94.0
Monitoring of vital signs more frequently than 4 hourly but not more frequently than hourly is a feature of MHDC.	38.1	40.0	28.5	35.8
An early warning scoring system e.g. (MEWS, MEOWS, Patient at Risk (PAR) should be used for all women receiving MHDC.	85.7	88.0	95.2	89.5
One to one care (with a professional in constant attendance) is a characteristic of MHDC.	76.2	88.0	85.7	83.6
Regular medical reviews are a characteristic of MHDC.	90.5	100	100	97.0
Joint lead clinicians (a consultant obstetrician and consultant anaesthetist) are a feature of MHDC.	95.2	100	100	98.5
Regular and frequent investigations e.g. bloods, ABG, imaging are used on an individualised basis during MHDC.	95.2	96.0	81.0	91.0
Immediate post operative care (e.g. first hour post LSCS) does not constitute MHDC.	85.7	64.0	71.4	73.1
Referral (as required) to specialist medical staff and or the critical care outreach team / intensive care unit are components of MHDC.	95.2	84.0	95.2	91.0
Referral (as required) to paramedical staff e.g. physiotherapist, ODP (excluding critical care nurses) are components of MHDC.	85.7	60.0	52.4	65.7

Table 6-7 Delphi survey round three results for section two (question two), grouped by OUs with similar birth rates.

The group 1 respondents did achieve consensus for the statements 'immediate post-operative care does not constitute MHDC' and 'referral to paramedical staff is a component of MHDC' whilst the other two groups did not. The former result was not significant when Fisher's Exact test was calculated, whilst referral to paramedical staff was significant (Fisher's Exact = 0.03, $p < 0.05$). Overall, there was close agreement for the statements that did and did not achieve consensus across the 3 OU groups for the rest of the statements in this section of the questionnaire.

6.3.4 Round three results for section two (question three)

Four of the 6 statements were comparable across the three OU groups in terms of achieving or not achieving consensus responses (Table 6-8).

	Group one A and B (3300 / 3300)	Group two C and D (4000/4500)	Group three E, F and G (1700/2200/1500)	A-G combined
Total number of respondents	21	25	21	67
Section 2. Question 3. Please indicate how strongly you agree or disagree with the following statements	Percentage strongly agree / agree responses			
The administration of IV fluids, blood products, IV oxytocics, tocolytics and insulin are components of routine maternity care that may be also used in MHDC.	100	100	90.5	97
A woman needing epidural anaesthesia, excluding pain relief during labour (e.g. post natal pain relief) will not be classed as receiving MHDC.	76.2	68.0	76.2	73.1
Routine care (e.g. pressure area care, patient / family support) will be performed as part of MHDC.	95.2	96.0	80.0	91
MHDC is more likely to be undertaken for maternal than fetal reasons.	85.7	88.0	85.7	86.6
MHDC is an interim level of care for women requiring interventions over and above the specialised 'high risk' care that will be carried out routinely on a consultant led labour ward, but not requiring care on an intensive care unit.	76.2	100	85.7	88.0
MHDC will be implemented where a patient has deteriorated clinically but her care can be managed appropriately on the labour ward.	95.2	100	71.4	89.6

Table 6-8 Delphi survey results of section two (question three), grouped by OUs with similar birth rates.

The definition of MHDC as 'an interim level of care for women requiring interventions over and above the specialised 'high risk' care that will be carried out routinely on a consultant led labour ward, but not requiring care on an intensive care unit' achieved consensus by the respondents of OU groups 2 and 3. Group 1 was close to achieving a consensus and a respondent who disagreed with this definition suggested it required refinement by the addition of "specialised obstetric care".

Respondents of groups 1 and 2 achieved consensus agreement that 'MHDC will be implemented where a patient has deteriorated clinically but her care can be managed appropriately on the labour ward', whilst group 3 was close to achieving consensus.

6.4 Round three results analysed by professional groups working in OUs with similar birth rates

The statements where the two professional groups (representing their respective OU groups), achieved or did not achieve consensus, for each section of the third round questionnaire are presented in sections 6.4.1- 6.4.4.

6.4.1. Results for section one and section two (question one)

The number of consensus responses (n=8) provided by the doctors and midwives working in OU group 1 were identical and applied to the same statements (Table 6-9). In contrast, the number of consensus statements provided by the doctors and midwives representing OU group 2 were the same (n= 5), but there was disparity in terms of the statements these related to.

Obstetric Unit (Annual birth rate)	Group one A and B 3300/3300		Group two C and D 4000/4500		Group three E, F and G 1700/2220/1500		A-G combined	
Professional group (DR= Doctor, MW = Midwife)	DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents	9	12	13	12	10	11	32	35
Intensive care (as opposed to MHDC) is required for;	Percentage yes responses							
Severe obstetric conditions (e.g. severe pre eclampsia, HELLP, eclampsia, major haemorrhage, acute fatty liver disease)	44.4	41.7	69.2	41.7	80.0	90.9	65.6	57.1
Suspected amniotic fluid embolism	55.6	75.0	69.2	50.0	70.0	100	65.6	74.3
Confirmed amniotic fluid embolism	100	91.7	76.9	100	90.0	100	87.5	97.1
Disseminated intravascular coagulation	88.9	91.7	76.9	100	90.0	90.9	84.4	94.3
Physiological deterioration / compromise (unstable patient despite escalation of appropriate care)	100	100	100	91.7	100	100	100	97.1
Continuous ECG monitoring and / or neurological observations required	33.3	66.7	46.2	58.3	30.0	100	37.5	74.3
Invasive monitoring – arterial line	33.3	58.3	53.8	58.3	70.0	100	53.1	71.4
Invasive monitoring – pulmonary artery flotation catheter (Swan Ganz lines)	88.9	100	100	58.3	100	100	96.9	85.7
Administration of inotropes / vasopressors (e.g. dopamine)	88.9	83.3	100	58.3	100	90.9	96.9	77.0
Drugs and / or fluids administered via a central line	22.2	16.7	30.8	50.0	60.0	100	37.5	54.3
Continuous oxygen therapy (e.g. > 50% given by face mask)	33.3	66.7	38.5	50.0	60.0	81.8	43.8	65.7
Continuous oxygen therapy (e.g. < 50% given by face mask)	0	0	7.7	33.3	10.0	45.5	6.3	25.7
Non invasive ventilation e.g. CPAP or BIPAP	100	100	76.9	66.7	80.0	100	84.4	88.6
Intubation and ventilation	100	100	100	91.7	100	100	100	97.1
Renal support	100	100	84.6	83.3	100	100	93.8	94.3

Table 6-9 Delphi survey round three results for section one (question one) analysed by professional groups from OUs with similar birth rates.

Fourteen of the 15 statements were identified as indications for intensive care by the midwives in group three, compared with nine statements for the doctors. Suspected AFE, continuous ECG monitoring or neurological observations, invasive monitoring (by arterial line), drugs / fluids administered via a central line and continuous oxygen therapy (e.g. > 50% given by face mask) were all identified as indications for admission to ICU by this group of midwives. However, only the statement pertaining to ECG / neurological monitoring was statistically significant (Fisher's Exact = 0.001, $p < 0.05$).

6.4.2 Results for section two (question one)

Overall, the doctors and midwives representing group 3 showed the closest professional agreement of the three OU groups for this part of the questionnaire as regards to the number of statements where consensus was (or was not) achieved (Table 6-10, p 205). There was only 1 statement where the doctors achieved a consensus response and the midwives did not, with 90% of the doctors agreeing that a woman receiving intravenous antihypertensives was an indication for MHDC, compared with 63.6% of the midwives.

There were 5 statements where the midwives achieved a consensus response and the doctors did not, across OU groups A and B. The greatest percentage difference was apparent for the statement 'suspected PE' with 44.4% of the doctors agreeing this condition was an indication for MHDC compared with 91.7% of the midwives.

Prolonged post-operative care was seen as an indication for MHDC by 83.3% of the midwives compared with only 55.5% of the doctors. There were 5 statements where the midwives achieved consensus responses and the doctors did not for OU groups C and D. The doctors also achieved consensus for 1 statement (acute surgical complication e.g. peritonitis / bowel obstruction) but the midwives did not.

	Group one A and B		Group two C and D		Group three E, F and G		A-G combined	
Professional group (DR= Doctor, MW = Midwife)	DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents	9	12	13	12	10	11	32	35
Section 2. Question 1: The following clinical scenarios are indications for MHDC:	Percentage strongly agree / agree responses							
Obstetric conditions – stable patient	0	8.3	7.7	16.7	10.0	9.1	6.3	11.4
Clinical instability due to a pre existing condition(s) (e.g. diabetes, cardiac, renal, liver, respiratory, haematological disorders)	88.9	83.3	84.6	100	100	100	90.6	94.3
Presence of severe pre existing condition(s) (e.g. diabetes, cardiac) where the woman is clinically stable.	55.6	41.7	61.5	41.7	50.0	18.2	56.3	34.3
Autoimmune disorder / central nervous system disorder where woman is clinically unstable	66.7	58.3	61.5	83.3	90.0	90.9	71.9	77.1
History of organ transplantation - stable patient	11.1	41.7	23.1	50.0	20.0	45.5	18.8	47.1
Morbid obesity	11.1	50.0	46.2	41.7	60.0	36.4	40.6	42.9
Suspected PE	44.4	91.7	69.2	75.0	60.0	72.7	59.4	80.0
Confirmed PE	77.8	100	100	83.3	90.0	100	90.6	94.3
Severe sepsis e.g. septicaemia	88.9	83.3	76.9	91.7	80.0	100	81.3	91.4
Acute surgical complication e.g. peritonitis / bowel obstruction	100	91.7	84.6	75.0	80.0	81.8	87.5	82.9
'Step down care' required post ICU or CCU admission	77.8	100	69.2	91.7	80.0	81.8	75.0	91.4
Prolonged post operative care because of unsatisfactory patient recovery	55.5	83.3	61.5	100	70.0	72.7	64.5	85.7
A woman receiving IV anti hypertensives (e.g. labetalol)	77.8	100	76.9	66.7	90.0	63.6	81.3	77.1
Serious concerns regarding maternal health, e.g. a woman may be at high risk of deteriorating	100	91.7	76.9	91.7	90.0	100	87.5	94.3

Table 6-10 Delphi survey round three results for section two (question one), analysed by professional groups from OUs with similar birth rates.

6.4.3 Results for section two (question two)

There were less differences of opinion in terms of the number of statements where consensus was (or was not) achieved by both professional groups across the 3 OU groups in section 2 (question 2) of the questionnaire (Table 6-11, p 106).

There were 2 statements where differences were apparent in OU group 1. Less doctors agreed that an EWS system should be used for all women receiving MHDC compared with all of the midwives. By contrast, 100% of the doctors agreed that immediate post-operative care (e.g. first hour post LSCS) did not constitute MHDC compared with 75.0% of midwives.

	Group one A and B		Group two C and D		Group three E, F and G		A-G combined	
Professional group (DR= Doctor, MW = Midwife)	DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents	9	12	13	12	10	11	32	35
Section 2. Question 2: Please indicate how strongly you agree or disagree with the following statements.	Percentage strongly agree / agree responses							
High risk labour (e.g. multiple pregnancy malpresentation, vaginal birth after caesarean section, pre term labour) on its own, is not an indication for MHDC.	100	91.7	100	83.3	80.0	81.8	93.8	85.7
Women with puerperal psychosis need psychiatric perinatal services as opposed to MHDC.	77.8	83.3	92.3	100	90.0	90.9	87.5	91.4
Non invasive monitoring e.g. BP, resps, continuous ECG, level of consciousness, fluid balance, observation of blood loss, will be performed as part of MHDC where clinically indicated.	88.9	100	100	91.7	100	81.8	96.9	91.4
Monitoring of vital signs more frequently than 4 hourly but not more frequently than hourly is a feature of MHDC.	22.2	50.0	38.5	41.7	40.0	18.2	34.4	37.1
An early warning scoring system e.g. (MEWS, MEOWS, Patient at Risk (PAR) should be used for all women receiving MHDC.	66.7	100	76.9	100	100	90.9	81.3	97.1
One to one care (with a professional in constant attendance) is a characteristic of MHDC.	77.8	75.0	92.3	83.3	80.0	90.9	84.4	82.9
Regular medical reviews are a characteristic of MHDC.	88.9	91.6	100	100	100	100	96.9	97.1
Joint lead clinicians (a consultant obstetrician and consultant anaesthetist) are a feature of MHDC.	100	91.7	100	100	100	100	100	97.1
Regular and frequent investigations e.g. bloods, ABG, imaging are used on an individualised basis during MHDC.	88.9	100	100	91.7	70.0	90.9	87.5	94.3
Immediate post operative care (e.g. first hour post LSCS) does not constitute MHDC.	100	75.0	84.6	41.6	80.0	63.6	87.5	60.0
Referral (as required) to specialist medical staff and or the critical care outreach team / intensive care unit are components of MHDC.	88.9	100	92.3	75.0	90.0	100	90.9	93.9
Referral (as required) to paramedical staff e.g. physiotherapist, ODP or nurses (excluding critical care nurses) are components of MHDC.	88.9	83.3	76.9	41.7	50.0	54.5	71.9	60.0

Table 6-11 Delphi survey round three results for section two (question two), analysed by professional groups from OUs with similar birth rates.

There were 3 statements where differences were apparent in group 2. Two statements were the same as those for group 1 (use of early warning scoring systems and immediate post-operative care). There was also a difference of opinion related to the statement 'referral (as required) to specialist medical staff and or the CCOT' with 92.3% of the doctors agreeing this was a component of MHDC compared with 75.0% of midwives.

There were 2 statements where differences were apparent in OU group 3. 80.0% of the doctors agreed that immediate post-operative care (e.g. first hour post LSCS) did not constitute MHDC compared with 63.6% of midwives. 70.0% of the doctors agreed that 'regular and frequent investigations were used on an individualised basis during MHDC' compared with 90.9% of midwives.

6.4.4 Results for section two (question three)

These results are reported in Table 6-12 below.

Obstetric Unit (Annual birth rate)	Group one A and B		Group two C and D		Group three E, F and G		A-G combined	
Professional group	DR	MW	DR	MW	DR	MW	DR	MW
Number of respondents	9	12	13	12	10	11	32	35
Section 2. Question 3: Please indicate how strongly you agree or disagree with the following statements	Percentage strongly agree / agree responses							
The administration of IV fluids, blood products, IV oxytocics, tocolytics and insulin are components of routine maternity care that may be also used in MHDC.	100	100	100	100	90.0	90.9	96.9	97.1
A woman needing epidural anaesthesia, excluding pain relief during labour (e.g. postnatal pain relief) will not be classed as receiving MHDC.	77.8	75.0	84.6	50.0	70.0	81.8	78.1	68.6
Routine care (e.g. pressure area care, patient / family support) will be performed as part of MHDC.	88.9	100	92.3	100	70.0	90.9	84.4	97.1
MHDC is more likely to be undertaken for maternal than fetal reasons.	100	75.0	100	75.0	90.0	81.8	96.9	77.1
MHDC is an interim level of care for women requiring interventions over and above the specialised 'high risk' care that will be carried out routinely on a consultant led labour ward, but not requiring care on an intensive care unit.	77.8	75.0	100	100	90.0	81.8	90.6	85.7
MHDC will be implemented where a patient has deteriorated clinically but her care can be managed appropriately on the labour ward.	88.9	100	100	100	90.0	54.5	93.8	85.7

Table 6-12 Delphi survey results of section two (question three), analysed by professional groups from OUs with similar birth rates

There was relative parity between the doctors and midwives' percentage level of agreement in group 1. The doctors representing group two achieved consensus responses for all 6 statements whilst the midwives did not achieve consensus responses for 2 statements (a woman needing epidural anaesthesia, excluding pain relief during labour will not be classed as receiving MHDC and MHDC is more likely to be undertaken for maternal than fetal reasons).

There were 3 statements where differences of opinion occurred between the doctors and midwives representing OU group 3. The midwives achieved consensus responses for 2 statements that the doctors did not (a woman needing epidural anaesthesia, excluding pain relief during labour will not be classed as receiving MHDC and routine care will be performed as part of MHDC). Conversely, the doctors achieved consensus (90% SA/A) that MHDC will be implemented where a patient has deteriorated clinically

but her care can be managed appropriately on the labour ward whereas only 54.5% of the midwives agreed with this statement.

6.5 Synopsis

This chapter has presented the results of the Delphi survey round three. Key findings to emerge are the conditions and interventions that would lead healthcare professionals (midwives and doctors) to request a woman's care be escalated to ICU as opposed to providing MHDC on the labour ward. It has also been identified that midwives working in the OU group with the lowest annual birth rates are more likely to escalate a woman's care away from the OU than their medical colleagues when encountering women with certain conditions and interventions. The results of the Delphi survey presented in chapters 4, 5 and 6 will be discussed in chapter 8. Chapter 7 will present the results of the Focus Group study designed to examine the factors that influence a midwife to provide MHDC or request the escalation of care (EoC) away from the OU.

Chapter 7 Focus Group study findings

7.0 Introduction

This chapter reports the findings of the focus group study that was designed to examine the local factors that influence a midwife's decision to provide MHDC or request the escalation of a woman's care away from the labour ward. The respondents' data comprising the Delphi theme of service delivery (section 4.6) suggested there may be variations between OUs in terms of how MHDC is organised and / or provided, reflecting the findings of previous studies (Cordingley and Rubin, 1997; Zwart *et al.* 2010). Additional findings from the Delphi survey suggested it was probable that midwives working in low volume OUs would escalate the care of an acutely ill woman to ICU as opposed to providing MHDC (section 6.4.1). The focus group study aimed to clarify / elaborate on how local service delivery and / or other features of MHDC identified during the Delphi survey influenced midwives' decisions to either provide MHDC or escalate care.

The characteristics of the focus group participants are reported in section 7.1 and section 7.2 presents a schematic summary of the phase two findings (Figure 7-1). The phase two research objectives (section 1.4.1) structure the rest of the chapter:

- To determine if local service delivery (e.g. annual birth rate, facilities) has an impact on a midwife's decision to provide MHDC or request care escalation **(section 7.3)**
- To ascertain if patient specific factors (e.g. the presence of comorbidity, clinical stability) influence midwives to provide MHDC or request care escalation **(section 7.4)**
- To examine if professional issues (e.g. midwifery expertise, education and training, skill mix) impact upon care escalation decisions **(section 7.5)**

- To determine whether clinical guidelines and / or other factors influence a midwife's decision to provide MHDC or request the escalation of care (**section 7.6**)

Notations for quotations from the data follow the sequence of OU code / Individual Data (ID) or Focus Group data (FG) / Band of midwife / Participant number (P) / Scenario number e.g. S1, S2, S3.

7.1 Focus groups

7.1.1 Characteristics of the focus group participants

The characteristics of the midwives who participated in the focus groups are summarised in Table 7-1.

Focus group	Number of participants	Mean number of years qualified as midwife (SD)	Number of direct entry midwives	Number of shortened programme midwives	Relevant critical care / high dependency education / training
Unit H (Band 7)	7	15.6 (6.3)	2	5	7 x none
Unit H (Band 6)	3	4.3 (3.2)	2	1	1 x HDC experience at previous hospital 2 x none
Unit I (Band 7)	5	24.0 (5.2)	0	5	4 x in house HDC training plus HEI recovery module or ILS / ALSO / ALS course or a combination of these 1 x in house HDU training only
Unit I (Band 6)	4	18.3 (9.3)	1	3	2 x ALERT course 1 x in house HDU training 1 x none
Unit J (Band 7)	9	19.8 (7.1) (One MW did not specify)	3	6	2 x Care of critically ill adult HEI course 1 x Prompt training 1 x in house HDU training 5 x none
Unit J (Band 6)	6	20.5 (13.9)	2	4	2 x Prompt training 1 x obstetric HDU experience 3 x none

Table 7-1 Characteristics of the focus group participants.

7.1.2 Focus group challenges

A number of issues arose during the focus groups. The focus groups were challenging to arrange and four were subsequently cancelled at relatively short notice due to high levels of activity on the labour ward, clashes with other meetings and staff sickness.

This meant the study took longer to complete than anticipated. At the final focus group

(OU H, Band six), arranged at short notice, only the researcher was able to attend and an assistant moderator was not involved.

The midwives took longer to review the objective data and complete the individual data sheets than anticipated. During the first focus group, technology problems meant the computer and data projector in the allocated room did not work and the video vignettes were shown to the participants on the researchers' laptop. The focus groups were anticipated to take approximately an hour, however late starts and some animated discussions meant the length of the focus group exceeded the anticipated time on more than one occasion. These issues reinforce the assertion that focus groups should, where possible, be piloted or a mock focus group undertaken (Krueger, 1998).

7.2 Schematic representation of the factors influencing a midwife's decision to escalate care

A schematic summary of the factors that influence a midwife's decision to provide MHDC or request the escalation of care is shown in Figure 7-1. This figure is devised from the themes, categories and codes comprising the final framework matrix (Appendix 13, Table A13-0). In order to promote credibility, this schematic summary was shared with 2 midwives in one of the OUs for member checking (Rees, 1997). Feedback from the midwives confirmed it summarised the issues and concepts they had discussed during their focus groups.

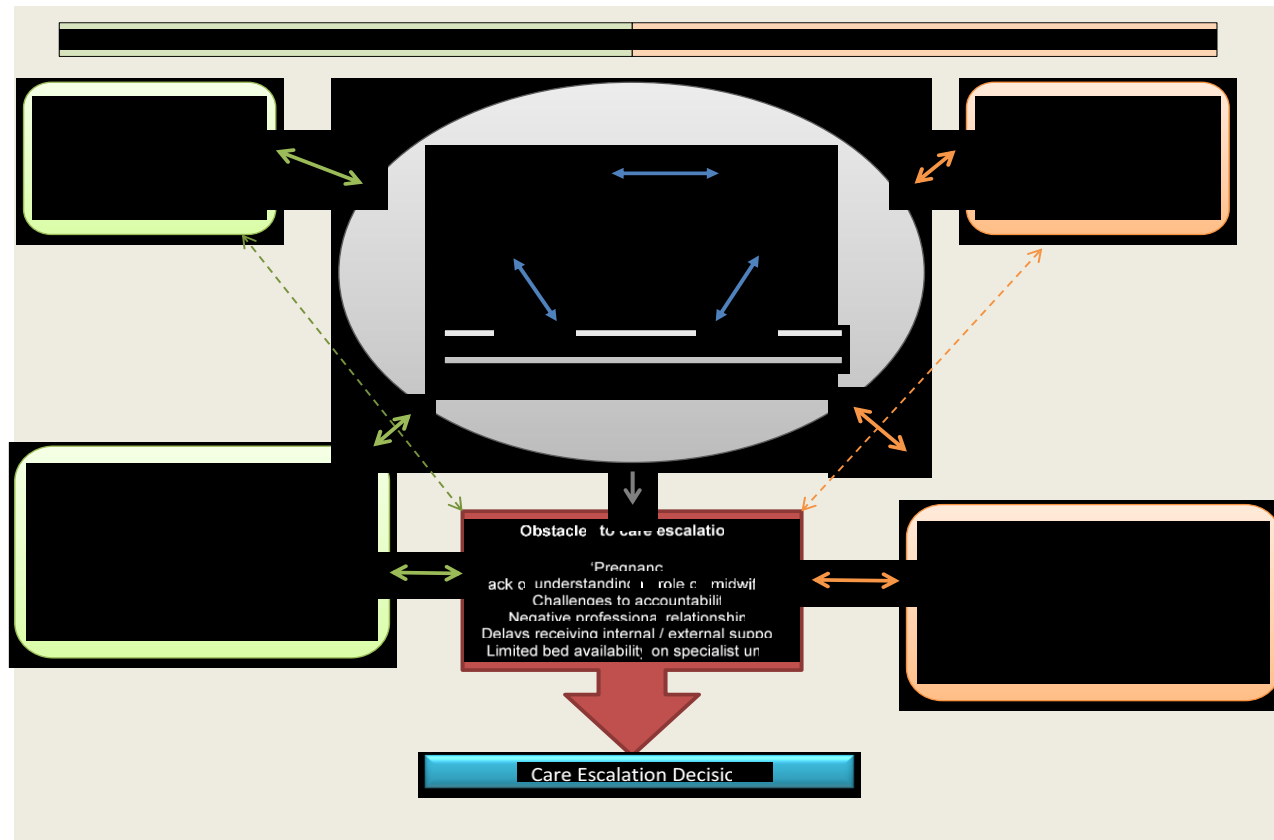


Figure 7-1 Schematic representation of the factors influencing a midwife's decision to provide MHDC or escalate care

7.3 The impact that local service delivery has on a midwife's decision to request care escalation.

The environment encompassed the local facilities on the labour ward (in terms of dedicated high dependency rooms), the equipment available to care for women requiring MHDC and the proximity of the labour ward in relation to specialist areas such as ICU. The bed availability on specialist units also had an impact on the midwives' EoC decision making. These factors were 'fixed' in as much as the midwives had limited or no opportunity to change them.

7.3.1 Facilities and Equipment

The facilities and equipment available to the midwives had an immense bearing on whether a woman could stay on the labour ward or her care be escalated away from the OU. Unit H had no designated high dependency beds and the midwives identified they did not have access to any specialist equipment (such as invasive monitoring) required for MHDC provision.

P1: If they want all that high-tech stuff, we're not geared up for it here.

(FG/ Unit H, Band 6 /S3)

Unit J had a fully equipped, designated high dependency care room on the labour ward with the requisite equipment to undertake continuous ECG and invasive monitoring. In contrast, OU I had a number of large rooms on the labour ward where women who were acutely ill could receive MHDC. 'Emergency' and 'high dependency' trolleys carrying the relevant equipment were taken to the woman's bedside. However, a Band 6 midwife from OU I expressed concerns about a lack of equipment and also regarding staffing levels and a lack of MHDC training.

P3 "I don't see why we have to take risks, something that's already risky when all the other times we're doing risk assessments to minimize the risks, in here we ask for trouble, every time we have someone who is very sick on the Labour Ward we're asking for trouble, 'cause we're not the appropriate place, we're not appropriately trained and we're not appropriately staffed. And we haven't got the equipment, half my time this morning was spent looking for equipment and I'm talking simple stuff now, I'm talking tocos for a CTG 'cause I heard a deceleration, not much, but it's something, so I can't find a toco, but I might be expected to care for a lady who has had like a 3000ml blood loss and might just pour blood and just like deteriorate before my very eyes."
(FG/ Unit I / Band 6 / S2)

7.3.2 Proximity of the labour ward to specialist areas

In terms of the location of the labour ward, the midwives from OU J viewed the closeness of their labour ward in relation to the ICU as a positive factor when making their EoC decisions. They identified they could safely keep acutely ill women 'longer' on the labour ward, knowing the ICU team could provide support quickly if required. By contrast, the midwives from OU H identified that the location of their OU (a separate building from the onsite ICU necessitating ambulance transfer) needed factoring in to their escalation of care decisions which, they made as early as possible.

P1: "Yeah location wise geography wise here, we're in an entirely separate entity from the main hospital so that to me, when I'm making decisions makes a difference because you've gotta think about a time scale, if you're asking for help how long its gonna to take to get them there you know and if you want emergency help".
(FG / Unit H / Band 7 / S1)

The midwives from OU H also identified they would involve the CCOT to assist them with transfers to ICU. Obstetric unit I was 'linked' to the main general hospital by a series of long corridors, but was a significant distance away from the ICU / general HDU. Midwives from OU I identified that the physiological instability of the woman in scenario one outweighed the need for her to be transferred off the labour ward.

*P2: "I 'd keep her on Labour Ward, Yeah
P1: Yeah, it would be... She's too poorly to be transferred.
P3: She is, and you wouldn't want to transfer her that ill.*

P4: She's still quite obstetric, so –
AJ: Transfer her where?
P1: To HDU or ITU
AJ: It's still in this hospital?
P1: Yeah, the main hospital, but you've physically got to move her from area to area, and at this stage she's not very stable, is she?"
(FG/ Unit I / Band 7/ S1)

7.3.3 Bed availability on specialist units

The midwives from OU H involved the bed manager and CCOT early on in their care escalation planning in recognition that ICU beds were not always readily available. The midwives from OU J stated they sometimes gave advance warning to the ICU in order for them to 'free up' a bed space in case it became necessary to escalate a woman's care. The Band 7 midwives of OU I gave an account of how a woman's management had to be altered when she could not be immediately transferred to the ICU due to a shortage of beds. The woman received mechanical ventilation in the labour ward operating theatre (with care from the consultant anaesthetist and theatre team) until an ICU bed became available and this was classed as level 3 care.

7. 4 The patient specific factors that influence midwives' decisions to request care escalation.

7.4.1 Clinical complexity

Clinical complexity included a woman's diagnosis, her stability / potential for physiological deterioration and her overall risk status.

7.4.1.1 Diagnosis

The women's diagnoses had an impact on the midwives' EoC decisions. Their narratives and individual data identified their familiarity with what they viewed as 'routine' obstetric conditions during the first and second scenarios.

Scenario one: What would you do in terms of care escalation?

Keep on HDU - 1 MW. Continue monitoring. As IV MgSO₄ and labetalol, obs graduating to at least hourly. 1 hourly reflexes. 6 hourly bloods. Reg reviews / consultant as needed.

Why?

Obstetric care that we deal with regularly.

(Unit J / ID / P4 / S1)

In contrast, scenario 3 prompted the midwives to consider the differential diagnoses for the woman, with a number of midwives identifying they needed a definitive diagnosis in order to determine whether EoC was required or whether care could continue in the OU.

P1: "I mean they usually do a VQ scan don't they, that would be fine as far as we are concerned, they go from (name of ward) for a VQ scan and things like that but it's just that, get a diagnosis first and then decide."

(Unit J / FG / Band 6 / S3)

The presence of comorbidity in scenario 3 also had an impact on the midwives' EoC decisions. Some acknowledged they were less familiar providing care for a woman with a cardiac condition and this was factored into their decision making. There was general agreement by the midwives of OU J that if a woman with a medical condition(s) had an otherwise uncomplicated pregnancy she could safely be transferred away from the OU to an appropriate specialist area.

What would you do in terms of care escalation?

1:1 on labour ward - awaiting medical review of results etc. High risk woman but obstetrically normal therefore consider either medical / cardiology ward or main HDU (not on Labour Ward)

(Unit J / ID / P3 / S3)

The midwives of OU H also discussed transferring the woman in scenario 3 off the labour ward, and transferring her back to the labour ward once pulmonary embolus or a cardiac problem had been excluded.

AJ: "General consensus you'd be transferring her to (AJ pauses)

P3: to HDU

P1: Yeah on the general side.

AJ: OK right.

P3: Until they've excluded anything non obstetric.

P1: As soon as they exclude a PE then we could have her over.
P2: Then we'd have her back.
P5: Unless it was something for cardiology.
P1: Then she may need to go to a major unit in...(name of City)".
(Unit H / FG Band 7 /S3)

The OU I midwives focused their discussions more around the clinical management of the woman in scenario 3, stating they had experienced problems when trying to transfer women with comorbidities to other specialist areas such as medical wards in the past. Only 1 Band 7 midwife stated the woman in scenario 3 required transfer off the labour ward and she was met with strong opposition from her colleagues.

7.4.1.2 Stability / risk of deterioration

The participants talked about the objective measures which enabled them to assess a woman's level of clinical stability and her risk of physiological deterioration, referring to biochemical and haematology results, fluid balance, and the EWS. During the first scenario, the midwives across all three OUs expressed concerns about the woman's severely deranged ALT results, her uncontrolled hypertension and the presence of clonus. They also acknowledged the woman's potential for developing eclampsia, liver haematoma, renal failure and intracranial haemorrhage. The midwives' predictions as to the type, and likelihood of such complications occurring influenced their care escalation decisions. Where physiological instability was evident or the potential for further deterioration was assessed to be high, EoC to a higher level was considered. However, not all midwives felt this escalation was required *immediately* during the first scenario.

Scenario 2 evoked concerns that the woman might suffer further deterioration in the form of haemorrhage, DIC and / or fluid overload, although some midwives identified she was relatively stable at the present time.

What would you do in terms of care escalation?

Concerns EBL 3000MLS, difficult peripheral cannulation, urine output 20mls/ hour. Unstable blood picture. Very high risk, plus high risk of further PPH. DIC. HDU / ICU (Intensive Care Unit).
(Unit I / ID / Band 6 / S2 / P2)

In conjunction with the objective parameters used to predict a woman's potential for physiological deterioration, some midwives made 'intuitive' assessments about a woman's risk of deteriorating, often using colloquialisms.

P3: "I'm right on the cusp with her, because she'll either get better or she won't, but my feeling is she's just about to deteriorate now, because we've thrown all the fluids at her, she's had her blood, how much more can her body cope with".
(Unit I / FG / Band 6 / S2)

And;

*P1: "Yeah – she could have cardiomyopathy.
P2: She's a hot potato. She could explode at any time.
P3: Because we haven't got a diagnosis, have we?
P1: No.
P2: And therein lies the problem. P1 Yeah, P2 So at the moment we're not sure, she needs diagnosing, she is a hot potato isn't she.
P3: Yeah, she could do anything
P1: She's got rapid resps. and she's desatting and.. (interposing)
P1: Well I think she's already gone off because she's desatting and requiring four litres of oxygen and she's got pain.
P4 She's got pain and a tachycardia. She isn't well."*
(Unit I / FG/ Band 7/ S3)

7.4.1.3 Risk status

The midwives frequently appraised the overall risk status of the women in the three scenarios, classing them as being high, very or extremely high risk. They also classed the type of care the women required as being high risk or complex care. A woman's level of risk as assessed by individual midwives influenced their EoC decisions.

*What would you do in terms of care escalation?
Senior MW and Reg / Consultant. CVP line to HDU or ICU. High risk care not for us. Over 1.5 litres MOHP
Why?
Very high risk.*
(Unit H / ID / Band 6 / S2 / P3)

7.4.1.4 Pregnancy

Pregnancy emerged as a factor that influenced the midwives' decision making, based on previous experiences of pregnancy being an obstacle to the EoC in some instances. During scenario 3, midwives of OU J identified that staff from other specialist areas such as medical wards, were often reluctant to accept pregnant women for admission.

P3: "I'd like critical care outreach to come with me because I think more and more often we're getting sick women who are also pregnant. Now is she a woman who is pregnant, it's not a problem with the pregnancy is it? She's having a PE and got other things going on. P5 So we are increasingly getting people because they are pregnant. P3 They're going oh, oh, maternity, maternity, she is not to me, a maternity patient. She's got this differential diagnosis of PE or...(pause), but she would have come to us because this happens a lot when they come, as soon as they've got that pregnancy they want us to have them".
(FG /Unit J / Band 6 / S3)

Some midwives justified the reluctance of specialist areas to accept pregnant women on the premise that the staff were generally concerned about providing care for pregnant women and afraid to administer medications which might harm the fetus. The midwives of OU I identified that they would keep the woman in scenario 3 on the labour ward 'partly by default' because of reluctance of other specialist areas to provide care for pregnant women.

P3: Because she wouldn't, well we would keep her partly by default as (name) says because nobody else would take her.
P1: Yes, nobody else would have her.
P4: As soon as they see they are pregnant that is it.
P1: Sometimes they don't even let them in at A and E. They just send them straight to us.
P2: They would say right, straight away, send her over.
P3: Yeah, straight away.
P1: You're lucky if you get a phone call.
AJ: So they wouldn't triage her in A and E and then send her over?
P1: No.
P4: Unless you've managed to slip in (all laughing)
P3: Yeah, she may not look terribly pregnant!
(FG /Unit I / Band 7 / S3)

It was also acknowledged that whilst staff from other specialties might find caring for pregnant women stressful or frightening, the midwives experienced similar feelings when faced with women whose problems were primarily of non-obstetric origin.

P3: "We can sometimes struggle to get the medical doctors over here. They like the patients to be on their ward.

P1: Whereas if they're pregnant they think she's our problem which is daft.

AJ: That's come up before

P3: They're scared of pregnant women aren't they. But we don't like people about to have a PE and everything else on our ward as well

so...(pause).and her ECG!"

(FG / Unit H / Band 6 / S3)

The midwives highlighted the importance of liaising and working with staff from other specialist areas to support them to provide care. They discussed how they visited pregnant women on non-maternity wards ('medical outliers') on a daily basis and performed antenatal examinations and fetal monitoring. This was seen as the most appropriate and safe solution for women requiring higher levels of care due to non-obstetric related illness.

7.4.2 Mother / baby considerations

The mother baby considerations category consisted of fetal / neonatal factors, mother baby separation and maternal support.

7.4.2.1 Fetal / neonatal factors and mother baby separation

During scenario 3, the assessment of fetal wellbeing, either by external CTG and / or ultrasound scan formed an integral part of the care escalation decisions made by the midwives. For some midwives, once 'obstetric' complications were excluded and fetal wellbeing had been confirmed, the transfer to a medical ward could be safely instigated, and specialists could deal with the woman's medical issues.

P7: "Despite being pregnant she's not an obstetric case, we're not concerned about her from an obstetric point of view."

(Unit J /FG /Band 7/ S3)

However, not all midwives shared this opinion, with some suggesting the woman would continue to be cared for in the OU setting until a conclusive diagnosis had been made.

Neonatal gestation was an important consideration for the midwives of OU H who acknowledged the possibility that a pre-term neonate may require transfer out of the OU if he/she did not meet the criteria for admission to the onsite SCBU. The Band 7 midwives of OU J aimed to avoid separating the mother and baby but were careful to take additional actions to maintain maternal safety, such as ensuring there were adequate staffing levels and appropriate external support.

What would you do in terms of care escalation?

Call critical care team for advice re care of CVP line. Ensure venflon access with team. To stay on HDU Labour Ward.

Why?

To enable her to be supported to stay with baby, but ensure adequate staff to provide care.

(Unit J / ID / Band 7 / S2 / P6)

The midwives appeared to have a lower threshold for escalating a woman's care off the labour ward if her baby was not with her, as discussed in relation to scenario 1.

P1: "I think if she's not got a baby with her, that would be one of the reasons why I would be less inclined to keep her on labour ward because I think to myself well, go let her get well, and then come back and worry about the baby side of things"

P4: Because if you've got a term baby or a baby with her you tend to be trying to keep them together don't you.

P1: That's the consideration for us, if we're doing a transfer across to ICU we don't like to separate mum and baby and I think in this case I would get her well first.

P2: And equally being a 30 weeker of course, that baby might end up being transferred out as well because we don't normally provide care for babies under 32 weeks so there is that possibility if there was any deterioration in the baby the baby would need to go elsewhere as well".

(Unit H / FG Band 7 / S1)

7.4.2.2 Maternal support

The midwives recognised there was a tension between keeping a woman on the labour ward where she could receive midwifery support, and the overriding need to ensure maternal safety. Some midwives highlighted the impact that a complication such as severe pre eclampsia might have on a woman, and identified the importance of

providing psychological support and keeping her informed of the progress of her baby where separation had occurred.

P6: "And then looking more holistically as well, this lady is a para 1, so she's previous (pause) we haven't got the notes, we don't know exactly what happened first time round but, this must be shocking for her if this didn't happen in her first pregnancy it's all very very different, so she needs some sort of psychological support as well (pause) and I'd wanna make sure that she's got her photo from special care as baby has gone off to special care, and information given for the woman and her next of kin and consent for anything we do". (Unit H / FG / Band 7 / S1)

Midwives also highlighted the importance of supporting women who required transfer to ICU by going to visit them. One midwife identified feelings of failure when she had been unable to keep women on the labour ward because complications had occurred.

P3: "And the mothers are traumatised when they go over there., they're traumatised by, you know, we promise them so much when they're booked in, we're gonna look after you, then they get very ill and we're saying, sorry we can't look after you any more, you need to go over to these other people, you can come back later and it's almost like you're feeling for them, that they have failed, and a feeling for us that we have failed, not to be able to keep her normal". (Unit I / FG/ Band 6 / S2)

Some midwives also expressed concerns regarding the potential impact that transfer to ICU might have on a woman, although these concerns were balanced against the need to promote maternal safety by escalating care when necessary.

7.4.3 Process of patient evaluation

The process of patient evaluation linked the maternal wellbeing and care plan themes together. The midwives' decisions surrounding the need (or not) to escalate care, included retrospective and real time analyses of each woman's clinical circumstance. The midwives also looked forward, making predictions about the monitoring and interventions that might be required in the future (the woman's care plan), and made predictions about the likelihood of a woman's condition stabilising or deteriorating. These predictions influenced their EoC decisions.

7.4.4 Care plan

7.4.4.1 Level of vigilance required

Vigilance included the staff to patient ratios, the level and type of monitoring and the investigations required to provide safe and appropriate care for women.

7.4.4.2 Staff to patient ratios

The midwives across all 3 OUs identified that the women in the scenarios required one to one care, with many maintaining a midwife should be in constant attendance. Their ability to provide the required level of vigilance (and avoid EoC off the labour ward) was governed by the variable influences of the labour ward staffing levels, skill mix and workload and influenced their EoC decision making.

P3: "And the rest of your workload on labour ward, you'd have to consider that you're not actually taking your midwife out of that room because when you've got someone who is needing that much care then you can't have her [the midwife] dipping in out can you, you've got to have that focus.

P1: and experienced staff looking after her.

P2 : The workload is moderate and the women are all in labour so yeah,

P3: I mean, if you've got an appropriate midwife, appropriately skilled and experienced midwife looking after her and you've got the support from outreach I think she could probably stay on labour ward but I'd have to think about it".

(Unit H /FG/ Band 7/ S1)

The midwives also expressed concerns about the impact this level of supervision could have on the other women on the labour ward and took this into consideration, stating that all the women on the labour ward required safe care.

7.4.4.3 Level of monitoring

The level of monitoring involved the midwives' judgements regarding the frequency and type of observations the women required. Across all 3 scenarios, the midwives identified the women needed 'frequent' observations and 'close' monitoring (Appendix 13, Table A13-1). Scenario 3 generated significant debate around the need for continuous ECG monitoring and midwives' abilities to interpret ECG's, whilst other

forms of non-invasive monitoring such as pulse oximetry were less of a priority in terms of the focus group discussions. During scenario 1, the recording of maternal observations every 5 minutes was accepted by the majority of midwives as suitable for care on the labour ward, with the caveat that there were sufficient staff available. Only one participant (Band 6 midwife / Unit I) questioned whether a woman requiring this frequency of observations required escalation to ICU or general HDU.

7.4.4.4 Non-invasive and invasive monitoring

The midwives' competence to care for women requiring non-invasive monitoring in the form of a continuous ECG and invasive monitoring (CVP lines) were factors that significantly influenced their EoC decisions. Some Band 7 midwives from OU J talked about invoking their staffing escalation policy in order to keep the woman on the labour ward in scenario two, with the proviso that the midwife caring for the woman received support in relation to CVP line management, and if further physiological deterioration occurred, the woman would require EoC.

P6: "She is quite stable, I would probably keep her on HDU on labour ward, but there are a few things I would need to consider. Staffing, because I notice the staffing and the ward is very busy, so I would need to risk assess because obviously she needs one to one care. It would have to be a midwife that could do CVP lines, not all our midwives do, umm, however we do work closely with the theatre team and there may be an ODP that can assist us with that. I would also be looking at do I need to get more staff to help cover labour ward because I have to look at the risks on the labour ward with such a sick patient around. So it might be escalated to the unit coordinator, supervisor, speak to the consultant and the anaesthetist saying look, she's stable but if she deteriorates we may need to move her to another place where she can get closer monitoring.

AJ: Does anyone else think that or think differently?

Yes - (four midwives agreeing in unison)"

(Unit J / FG / Band 7 / S2)

Seven of the 9 Band 7 midwives from OU J established the woman in scenario 2 could receive MHDC. In contrast, all of the Band 6 midwives agreed the woman would require transfer to the general HDU because of the presence of the CVP line which, was stated in a clinical guideline. The differences in opinion between the Band 6 and 7

midwives are demonstrated by excerpts from the framework matrices in Appendix 13 (Tables A13-2 & 3).

The Band 7 midwives from OU J acknowledged the difficulties in midwives maintaining their competencies when managing CVP lines, but had strategies in place to support the Band 6 midwives, who often did the 'hands on' care. However, these strategies varied between midwives and included involving the theatre team, Acute Care Team, CCOT and / or the anaesthetist, to provide the necessary support and education for the midwife allocated to provide MHDC.

In contrast to OU J, the Band 6 and 7 midwives from OU H were united in their decisions to escalate the care of the woman in scenario 2 off the labour ward. These midwives proactively involved the bed manager, CCOT and ICU staff early on in the scenario and stressed they did not provide care for women with CVP lines. They did not possess the requisite skills (or equipment), and EoC was indicated in their local clinical guideline.

AJ: "What would you want to do in terms of care escalation with this lady and why?"

P1: The minute you said CVP (CVP said in unison by all midwives with some laughter), the lady needs to go!

*P6: Yeah, we **don't** keep her on labour ward.*

Participants: Yeah". (All agreeing together with some laughter).

(Unit H / FG / Band 7 / S2)

The Band 7 midwives from OU I agreed the woman in scenario 2 would remain on the labour ward, and classed her as receiving level 2 care (Appendix 13, Table A13-4).

Some of their discussions focused on the 'normal' practice in their OU which, involved transferring women with major obstetric haemorrhages to ICU (whilst under general anaesthetic), after examination under anaesthetic (EUA) had been undertaken.

These midwives spoke about ensuring a midwife 'experienced' in managing a CVP line was allocated to care for the woman. They did not elaborate on how they classed a

midwife as being 'experienced' and acknowledged that they did not encounter women with CVP lines regularly. One midwife identified that the midwife caring for the woman should not be 'intimidated' by the CVP line. Enlisting support from the anaesthetist was seen as a strategy for ensuring the midwife allocated to care for the woman was 'comfortable' with the CVP line.

In contrast to their Band 7 colleagues, 2 of the Band 6 midwives from OU I stated they would request that care be escalated off the labour ward in scenario 2. The reasons given for this EoC included the woman's potential for further physiological deterioration and the workload on the labour ward (Appendix 13, Table A13-5). Two midwives stated they would keep the woman on the labour ward providing another professional took responsibility for management of the CVP line. There were differences of opinion between the Band 6 midwives in terms of their escalation of care decisions and their underpinning rationale for their decisions. Obstetric unit I employed Band 5 nurses who worked on the labour ward to assist the midwives. There was debate regarding the capability of the nurses to care for women needing MHDC and tensions about their role were apparent, as reported in section 7.5.3.3.

The request for continuous ECG monitoring in scenario 3 raised concerns for the midwives across all 3 OUs, with the majority identifying they were unable to interpret ECGs. The way midwives dealt with the request for continuous ECG monitoring varied across the OUs. The midwives from OU H identified that assessment by the CCOT would be required with a view to escalating the woman's care away from the OU. Both the Band 6 and 7 midwives were very clear that they did not care for women with continuous ECGs and that care escalation was required.

P4: "...they also want a continuous ECG, which none of us interpret, we don't do ECGs

P1: We don't, we can't tell when it's abnormal.

P2: But we would often have somebody particularly on the [name of ward] ward, we've had people who've had ECGs.

P1: Yeah, but not continuously.

P6: Yeah, but they're asking for continuous monitoring of an ECG.

[Interruption.....]

P4: We wouldn't read them; we wouldn't know how to interpret them.

P5: If it went beep or something, we'd know it was doing something (laughter)

P4: She wouldn't be on a continuous ECG here.

P5: Again outreach would need to be contacted and come and assess."

(Unit H / FG/ Band 7 / S3)

The Band 7 midwives of OU J identified that, although they had the relevant equipment, they would rely on the medical staff to interpret the ECG. The decision as to whether the woman in scenario 3 stayed on the labour ward or her care was escalated varied, with some midwives electing to provide MHDC, whilst others identified that transfer to a medical ward or Coronary Care Unit (CCU) was more appropriate. Some of the Band 6 midwives looked to the CCOT for support.

AJ: "So how do you get around the issue of her being on a continuous ECG?

P3: We've got one here [focus group being conducted on the labour ward].

P8: but it's not our speciality to read an ECG.

P5: But the registrar and the anaesthetist would be coming in to view it. As long as you know what normal is then as soon as you get something strange you get someone to come and review it don't you.

P8: It's like someone putting someone on a CTG then leaving the room, it doesn't matter, if you're not there to see it, it means nothing as you're not there to interpret it. You could think lovely I'm quite happy with that and ...

P3: But she is a medical patient so the lead clinician should be the physicians really, I suppose each unit, depending on their, I suppose it depends on their working relationships whether she stays or whether she goes.

P5: Umm..

P2: But I don't think it would be unreasonable for her to go."

(Unit J / FG/ Band 7 / S3)

All but one of the Band 6 and 7 midwives from OU I stated they would keep the woman on the labour ward. The Band 7 midwives stated they would ask an anaesthetist to interpret the ECG whilst the Band 6 midwives did not have clear strategies for dealing with this but expected 'another' professional to take responsibility for this aspect of the woman's care.

P2: "But I agree the scenario is pointing to a PE because she's at a higher risk and I would be happy to keep her as long as they're not relying on me to read that ECG"

P3: I don't think they would

P2: No

P3: I've never been asked to read one yet

P2: No

AJ: If somebody says to you, you need to be on continuous ECG, what does that mean to you then?

P3: I'd expect someone to be in there reviewing it frequently

Ps: (other midwives agreeing)"

(Unit 1 / FG / Band 6 / S3)

The Band 7 midwife who stated the woman should be transferred off the labour ward to a medical ward was met with strong opposition in this focus group and, the additional factors of 'pregnancy' being an obstacle to appropriate care escalation and the potential compromise of maternal safety was raised.

P5: "I suppose my initial gut feeling was stabilize her obstetrically and then she needs a medical transfer because we're not equipped to deal with a full blow problem"

Ps: No, no, no, no (others disagreeing forcefully)

P1: They would stay with us

P5: But then as you just said if we're not capable of looking after an ECG...

P1: But they won't do it.

P5: Well then, they'll put that woman's life at risk.

P1: But if we said that the ECG needed reading we would just get an anaesthetist do it.

P3: Yeah, they wouldn't take her because she's pregnant".

(Unit 1 / FG / Band 7 / S3)

7.4.4.5 Investigations

The midwives from OUs J and I made recommendations for the investigations the women in the 3 scenarios required. Midwives requested specific investigations to enable them to assess (in conjunction with the MEOWS scoring) whether a woman's condition was improving or deteriorating. These investigations would inform their decision to either keep the woman on the labour ward or escalate her care.

P2: "And do those bloods again to see if that trend is still..."

P1: Yeah we know that those platelets could be plummeting or coming back up.

P3: There was no clear plan to repeat the bloods was there?

P1: Well the consultant has just left so nothing is going to happen until nine. It is an hour and a half since the last bloods.

AJ: So talking about your escalation policy do you think on what you have got there, they would be thinking about transferring her or would they be wanting you to keep her and wait?

P4: No we would keep her, we wouldn't transfer her,

Interposing yeah, yeah

P3: Get the next lot of bloods really and review, cause if the platelets go lower we're in trouble".

(Unit J / FG / Band 6 / S1)

The requests for specific investigations in scenario 3 (chest X ray, ventilation perfusion scan) assisted in confirming the woman's diagnosis. The requests for investigations were made alongside requests for physician input. The midwives of OU H talked less about the women in any of the scenarios requiring further investigations. This may, in part, be explained by their focus on the need to escalate the women's care off the labour ward with relative immediacy and negating the need to assess physiological parameters that would indicate ongoing clinical deterioration.

7.4.4.6 Interventions

The midwives assessed the treatments the women in the 3 scenarios had received, were receiving and those they might require prospectively, in order to promote physiological stability and avoid EoC off the labour ward. During scenario 1, the midwives across all the OUs discussed the need to increase the woman's intravenous antihypertensive dose, whilst some considered the need for the addition of a second antihypertensive. They discussed the importance of continuing the magnesium sulphate infusion and ensuring strict fluid restrictions were in place. These measures focused on preventing further physiological deterioration and morbidity / mortality associated with uncontrolled hypertension and fluid overload, thereby negating the need to escalate care away from the labour ward.

P2: "I'm gonna make sure that lady has one to one care, so her midwife is not needed elsewhere and she hasn't responded as yet to the Labetalol, her blood pressure is still the same so we could look at what other anti-hypertensive she could have but you've got to be cautious in case it crashes.

P3: But equally we know that that there is an increased risk of intracranial haemorrhage if you don't get their blood pressure down particularly if she's complaining about a frontal headache".
(FG / Unit H /Band 7 /S1)

Scenario 2 prompted less discussion about prospective treatments from the Band 6 midwives of OU J and the Band 6 and 7 midwives of OU H, where the emphasis centred on the issue of the woman having a CVP line in situ. Their attentions were focused on transferring the woman off the labour ward. In contrast, the midwives of OU I and the Band 7 midwives of OU J discussed the need for administration of additional blood products and uterotonics, including tranexamic acid and misoprostol to promote stability and negate EoC off the labour ward. The insertion of a Bakri Balloon to treat / prevent further uterine atony was also suggested by these midwives.

During scenario 3, the midwives across the OUs discussed the possible need for the woman to receive treatment for venous thromboembolism and receive medical input for the management of her diabetes. Whilst the majority of midwives acknowledged the woman required facial oxygen to maintain normal oxygen saturations, greater emphasis was placed on the investigations she required in order to secure a diagnosis and the need for her to have continuous ECG monitoring.

7.5 The influence of professional issues on care escalation decisions

Variable influences on the midwives' EoC decisions were those factors that were 'changeable' and the midwives had little or no control over. These factors included the labour ward staffing levels and skill mix, workload, and the effectiveness of multidisciplinary team working and support.

7.5.1 Staffing levels and skill mix

The midwives acknowledged the importance of ensuring the staffing levels on the labour ward were adequate in order to facilitate the continuous one to one care they associated with MHDC care provision. The midwives discussed the labour ward workload, staffing levels and skill mix collectively.

P6: "She is quite stable, I would probably keep her on HDU on labour ward, but there are a few things I would need to consider. Staffing, because I notice the staffing and the ward is very busy, so I would need to risk assess because obviously, she needs one to one care. It would have to be a midwife that could do CVP lines, not all our midwives do, umm, however we do work closely with the theatre team and there may be an ODP that can assist us with that. I would also be looking at do I need to get more staff to help cover labour ward because I have to look at the risks on the labour ward with such a sick patient around...."

A: Does anyone else think that or think differently?

Yes" (three midwives agreeing with P6 in unison)

(Unit J / FG / Band 7 / S2)

Skill mix in the context of midwives providing care for the women in the 3 scenarios appeared to be synonymous with those classed as 'experienced' or 'senior' or 'competent' (Appendix 13, Table A13-6). There appeared to be general agreement that the women in all of the scenarios required care by midwives who met these criteria. Whilst the midwives did not explicitly state how they defined being 'senior' or 'experienced', the issue of whether a midwife had previously undertaken her registered nurse training or was 'direct entry' was raised as an important factor. A nursing background was seen as a positive feature by some of the midwives in relation to the care of women who were 'sick' or required invasive monitoring. Nonetheless, it was also acknowledged that a nursing qualification did not take the place of ongoing education and training in relation to MHDC.

P4: "A good thing to have is a nurse who's then become a midwife, and that's a good background for caring for somebody who is this ill, but only in as much as you want HDU training for your midwives because that's what we've not got, because I don't have that. It takes all my efforts to become a bit nurse again and work out the nursing side of it, I could do the midwifery side of it until it gets very very abnormal". (Unit I / FG/ Band 6 / S1)

One shortened programme midwife felt she might be better equipped to detect impending clinical deterioration and able to prepare for it, but also acknowledged the skills her direct entry colleagues possessed.

P1: "I'm nurse trained and which it even more scary because you can kind of see things coming around the corner sometimes. And then you would have what (name) is saying, certain equipment and bits and pieces ready.

AJ: Yes, that's come up before, whether you have your nursing or not.

P1: It does make a difference, but all of the girls here, even if they are straight into midwifery know if someone's not well. I think sometimes when you've worked in the environment with really ill people you know the kit you need and we may not have got that on labour ward.

P2: You need all your stuff for intubation, all that sort of stuff if you need it if she suddenly fits or everything really."

(Unit H / FG / Band 6 /S1)

The Band 7 midwives of OU J suggested that skill mix was at times, more important than adequate staffing levels, when women required MHDC. Proactive measures were in place in OU J to support, develop and upskill new or less confident staff.

P3: "I know we always talk about staffing and things but I do feel it's more skills than numbers, we have lots of conversations about this don't we? You could have ten midwives on duty but no one able to look after this sick lady. Whereas you could have five midwives on duty and any one of them could look after this kind of patient, so I think it is definitely about skills and abilities as well as numbers.

AJ: Yes, so how do you get around that on a daily basis then?

P3: Just ensure that off duty is staffed and skilled appropriately. If you've got a good skills mix.

P8: We've got a good Practice Development Team, there's two and a half of them now, who are really supportive and they will put people through what training they need.

P3: We've got clinical mentors like (name) who are in the sort of posts where they are really supporting the less confident staff and staff who may not have worked in this environment for a long time."

(Unit J / FG /Band 7 /S2)

The Band 6 midwives from OU I shared the same sentiments as the Band 7 midwives of OU J, acknowledging the importance of having the correct skill mix of staff on the labour ward. Some expressed concerns that on 'paper', the correct levels of staffing were in place, but the correct 'numbers' did not necessarily translate into a skill set that facilitated MHDC. The lack of (and need for) adequate training to enable midwives to provide MHDC was raised by the Band 6 midwives of OU I, who expressed concerns

that the differing abilities of the midwives to provide care for sick women, had the potential to lead to inequalities in care provision, and their discussions suggested that formal guidance was required.

P3: "It's not fair on the women to have inequality of care because somebody might have HDU and critical care skills and be quite happy to do it but the next person isn't, so you've got to have some kind of policy to escalate the women's care so that they've got equality of care in the appropriate place".
(FG/ Unit I / Band 6 / S1)

When midwives did not possess the necessary skills to provide aspects of MDHC many sought help whilst some considered EoC away from the labour ward to ICU.

The apparent disquiet of Band 6 midwives of OU I also appeared to stem in part, from the inclusion of the Band 5 nurses on the labour ward off duty. There was suggestion that fragmentation of and reduction in the workforce occurred when the nurses were moved off the labour ward to cover other areas of the OU, and this had a negative impact on the staffing levels.

P3: "And that's the other thing, it's expensive to look after these ladies in time, in midwifery time and in other things, I can't explain it very well, but it takes midwives off the floor, one midwife, one woman, we're not staffed for that cause if you've got one person in a room, we notice it on the rest of the workload and we've already dumbed down by having nurses and I don't mean that in a rude way, but you haven't got like 6 or 7 midwives on the floor, you might have 3 nurses, 4 midwives, you know that does happen, so you haven't got that skill, yeah, you got people, oh and then add in if you like perhaps add in 2 healthcare's and then you might have 2 of your nurses gone off on the wards doing a drug round or somebody's gone downstairs, so we're diminishing, it's like a dripping tap. On paper, there are enough people, but actually you haven't got the experience and the knowledge."
(FG / Unit I / Band 6 / S3)

7.5.2 Workload

The labour ward workload had an impact on the midwives' care escalation decisions.

The midwives were informed that in scenario 1 the workload was moderate, whilst in scenario 2, the workload was high and a Band 6 midwife was off sick. In scenario 3, the

workload was identified as low to moderate. High activity levels and reduced staffing on the labour ward were considered as triggers for care escalation away from the labour ward in scenario 2 by the midwives of OU I. Concerns were expressed that should the woman's condition deteriorate further her care may be comprised as there may not be enough midwives to provide care and the high workload might also impact on the availability of doctors.

P1: "We know this is a very busy delivery suite don't we, we're already one Band 6 down, high work load, you've got 3 going to the postnatal ward, but that's in 60 minutes, I think that can throw you a bit because (pauses) I think this woman is quite...even though she appears stable, I think she's highly likely to escalate and have DIC, I think she is at risk of a further PPH, she's got limited venous access and she's... cause her fibrinogen is dropping. She's already lost 3000mls, all she needs to do is collapse and you've got very limited peripheral access, you'd be very limited, so you'd need anaesthetic consultants freely available by the sounds of the suite, its highly busy, so I don't think she would get the care that she would require in an emergency."

AJ: What would you like to do with her?

P1: I would like her 1:1 and in a (pause) shipped off that unit because it's far too busy, they can't possibly deal with her there can they".

(Unit I / FG/ Band 6 / S2)

The Band 7 midwives of OU J had a staffing escalation plan in place to ensure the labour ward remained safely staffed when the workload was high but some also discussed transfer to the general HDU or ICU as an alternative plan for the woman in scenario 2. They contacted the maternity unit co-ordinator, supervisor of midwives, consultant obstetrician and anaesthetist in accordance with the escalation guideline. One midwife from OU I identified that the midwives' handover at the whiteboard was not always a true reflection of the workload in terms of women's acuity levels and she had challenged what she saw as inappropriate allocation of staff to women on the labour ward by the co-ordinating midwife.

P3...so each person is so different so you can't stand at a board and think, right, there's eight ladies, six midwives, well they're all about the same, two to that midwife, one to that midwife, one to that midwife, and I aren't saying they do allocation carelessly, they take great care but they haven't got the whole picture so we've got to be...go back to them and say actually no this

isn't appropriate, please rearrange my allocation, which you know I will speak up. I don't want to be made vulnerable". (FG / Unit I / Band 6 / S3)

7.5.3 Multidisciplinary team working and support category

The presence of, and support from the multidisciplinary team had a definite and vital impact on midwives' EoC decisions. This category included both 'internal' and 'external' supporters. Where professional relationships were perceived to be suboptimal, these became potential 'obstacles' to the midwives' EoC decisions.

7.5.3.1 Internal supporters

Internal supporters were those professionals who worked permanently or frequently within the OU setting. Internal supporters included the:

- Band 7 midwife in charge of the labour ward on a daily basis (the Co-ordinator)
- Consultant Obstetricians
- Anaesthetists
- Theatre Team / Operating Department Practitioners
- Band 5 Registered General Nurses (OU I, only)

The labour ward co-ordinators were key players in the EoC decision making process. The Band 6 midwives sought advice and guidance from the co-ordinators and involved them early on in the EoC decision-making process. The co-ordinators were recognised for their experience and clinical expertise. Some Band 7 midwives highlighted the importance of physically reviewing a woman, and not relying on verbal information alone. They used their clinical expertise (and intuition) to assist them in gauging the severity of a woman's condition.

P3: "So any woman who is critically ill, that we refer to as critically ill, then somebody like this needs to physically reviewed by the coordinator. It's no good having the story at the board. You need to go in and see them

P1: Yeah, definitely.

P2: Because your experience and instinct will tell you just how well or how unwell she is".

(Unit I /FG/ Band 7 /S3)

The midwives looked to the senior obstetricians and anaesthetists for support in ensuring the appropriate EoC decisions were made. These professionals were able to instigate the investigations and interventions required. The anaesthetists were identified as the professional group that supported the midwives with ECG interpretation, the management of invasive monitoring and provided general advice regarding the care of acutely ill women. Additional internal support for midwives caring for women requiring invasive monitoring was sought from the theatre team and / or the ODPs in OU J.

P7: Recently I got theatre, because we were busy on labour ward and the midwife didn't know how to use the CVP line and the theatre staff came across and ran thorough it with her, and next time they watched her do it and she was absolutely fine.

(Unit J /FG/ Band 7 /S3)

Positive working relationships between the midwives, consultant obstetricians, and anaesthetists were acknowledged across all 3 OUs during the focus groups. Cohesive multidisciplinary team working was implicit when the midwives talked about the trust they had in their obstetric and anaesthetic colleagues, recognised their accurate clinical decision-making and acknowledged their willingness to refer to other specialists.

P4: "I think we are really lucky, we do have really good multidisciplinary team working between the consultant, the anaesthetist, to the coordinator involved". (FG/ Unit J / Band 7/ S3)

The Band 7 midwives from OU I also recognised the contribution made by the Band 5 nurses who they sometimes allocated to provide MHDC. Only one Band 7 midwife specified she would want a midwife as opposed to a Band 5 nurse caring for the woman in scenario 2, because the nurses were not trained to perform uterine palpation and could not distinguish uterine contraction from atony.

7.5.3.2 External supporters

External supporters were those professionals who worked outside of the OU, but were called upon to support staff in caring for women receiving MHDC or facilitate EoC decisions. External supporters included the:

- Intensivist / Intensive Care staff
- Critical Care Outreach team (sometimes termed the Acute Care Team in OU J)
- Haematologist / Blood Transfusion Team
- Cardiologist / Physicians
- Radiology Department
- Other specialist support e.g. Diabetic Specialist
- Bed manager / Supervisor of Midwives

Referral to and liaison with intensivists, the ICU and the CCOT were mentioned the most frequently of all the external supporters available to the midwives from OUs H and J. The midwives relayed the positive relationships they had with the ICU staff and CCOT and midwives from OU J suggested this occurred as their opinions were trusted and they sought help appropriately.

P2: "If she started to deteriorate any more, if she needed more oxygen and her respiratory rate was going up and you had all the other signs. P9:

That's were your outreach comes in

P5: and we have called outreach before and they can get them a bed really quickly on ICU,

P3: Yeah, we've got outreach nurses who will come over immediately.

P4: Because we don't call them very often, when we do call them they know it's real". (FG / Unit J / Band 7 / S3)

The midwives from OU I appeared to liaise with the consultant anaesthetist as the first line of support more frequently than the CCOT, whilst in OU H, the midwives looked to the CCOT to provide clinical support, liaise with other professionals and organise transfers from the OU to the ICU or general HDU.

P3: "I would like a haematologist involved.

AJ: So, would you be bleeping them as the coordinators?

P1: Yeah or liaise with the consultant to do that.

P4: Outreach are pretty good here I don't know about elsewhere but if we involve outreach, they do a lot of liaising for us on our behalf and help out.

P2: Yeah, they're really good."

(FG/ Unit H/ Band 7/ S3)

The midwives from OU H were very clear as to who they contacted for support and when. They worked to an EoC clinical guideline and did not deviate. The focus groups held with the midwives of OUs I and J suggested that local variations between midwives working on the same labour ward were sometimes apparent, with different midwives seeking different support mechanisms.

7.5.3.3 Negative professional relationships

Whilst the midwives across all 3 OUs identified the trust and confidence they placed in their obstetric and anaesthetic colleagues, some appeared to lack confidence in the clinical decision-making abilities of locum and junior doctors.

P2: As long as it's not a locum. Otherwise we have to tell them what to do.

P1: Yes [all agreeing, some laughing]

(FG / Band 7 / Unit I / S3)

In OU I, Band 5 nurses were employed to work with the midwives on the labour ward. The Band 6 midwives displayed very mixed opinions regarding the support provided by the Band 5 nurses and professional tensions were apparent. They questioned the level of skill the nurses possessed, and viewed their lack of midwifery expertise as a negative factor when they were allocated to care for women requiring MHDC.

P4: "Some are more capable than others, they're all great, they're all willing, but some are more capable than others, because I've gone in after them..."

P2: It's not appropriate that they should be caring for them [Women needing MHDC] because they've got no midwifery training, they don't know the significance, 'because I'll just walk in the room and know because with experience, well they haven't got that, have they?' (FG/Unit I/ Band 6 S1)

The midwives were also concerned that as the Band 5 nurses provided care for this group of women, they were at risk of being deskilled.

7.5.3.4 Other professionals' uncertainties regarding the midwifery role

Some midwives felt those professionals working 'outside' of the OU environment did not fully understand the roles and responsibilities of a midwife and did not realise that some midwives do not hold nursing registrations. This could lead to conflict when requesting the transfer of a pregnant woman to another specialist area such as a medical ward and the midwives were left to reconsider the best course of action. The midwives from OU J relayed an example where the staff of a medical ward were reluctant to accept the transfer of a woman on the basis that the midwives on the antenatal ward were nurses and needed to provide care on the ward as an interim measure.

*P3: "But it's about fear and lack of knowledge about our role because a lot of people don't realise that we are not nurses, they don't realise, with the incident with the epileptic, we were saying we have no nurses on duty, 'well of course you do, you're on duty' and I said well I am dual qualified but I **don't** hold a nursing registration and **nobody** holds a nursing registration so.... So, you know its understanding, she was far better going to a medical ward with our input than the other way around".*

(FG / Unit J / Band 6 /S3)

7.5.3.5 Delays receiving internal or external support

Overall, the midwives experienced infrequent delays when requesting help and advice from their internal supporters. Nonetheless the Band 6 midwives from OUs H and I did highlight that the obstetricians and anaesthetists might not be available with immediacy

if they were already busy, or needed to be paged because they were not physically present on the labour ward, making them consider whether EoC off the labour ward was the safer option.

More concerns were voiced in relation to delays when obtaining external support, especially from physicians. These concerns were raised across all three OU's although the midwives from OU I suggested that delays were shortened when the consultant obstetrician liaised directly with the relevant physician. Some OU H midwives questioned the safety of waiting for physicians to review women suggesting it would be safer to escalate their care off the labour ward. These midwives also reiterated that because the OU was 'separate' from the general hospital, physical distance may also have contributed in part, towards these delays.

P1: Yeah, recently we have had two ladies with query PE on the postnatal ward but it happened to be totally inappropriate because as (name of midwife) said, it's really difficult to get the medical staff over here and often they're waiting and waiting when it's not necessarily that safe. We're just sitting on them, we're not the right people to be looking after them really.
(FG / Unit H / Band 6 / S3)

7.5.3.6 Midwifery Accountability

The midwives were clear regarding the aspects of care they felt competent to provide across the 3 scenarios and those they could not. The majority of midwives across the 3 OUs did not feel competent to care for women requiring invasive or ECG monitoring. They acknowledged their limitations and took measures to ensure they worked within their professional code; either by requesting additional support to care for a woman, or by requesting the EoC.

Some midwives identified that in spite of once being competent to care for women needing invasive monitoring, they could not keep up to date as they did not encounter women requiring this on a regular basis. The midwives from OU J identified that they

had discussed what constitutes 'on a regular basis' in a meeting and, it had been decided this was monthly, and unachievable, given the relatively low numbers of women they cared for who required invasive monitoring.

AJ: "So that is a critical thing, practising the skill regularly?"

P2: Yes, so that is why we can't maintain it.

AJ: What do you call regularly then?

P4: Well, we've tried to thrash it out with [manager's name] and [her] line was at least monthly.

AJ: So, one patient with a CVP per month?

P3: And we never have that over here, per midwife. (Others all agreeing)"

At times the Band 6 midwives of OU I felt pressured to care for acutely ill women on the labour ward and their accountability as NMC registrants challenged;

P4: "I think there can be a lot of pressure on midwives to do more than their midwifery role, so can you cope with this lady on Labour Ward or is it going to be psychologically more traumatising for her to move to ITU? We have to step back from that because we are midwives and not.

P2: nurses?" (FG/ Unit I / Band 6 / S1)

One midwife described the feeling of "being pulled in a number of directions" whilst another stated she did not want to be made to feel "vulnerable" when providing care for women requiring MHDC. Their narratives highlighted that at times their professional accountability was challenged and they had to be professionally assertive;

P4: "What was also telling was, you said those words, those famous words that make us all feel like we've got to try harder, because we're not trying hard enough, 'can you cope with' (pause) that's such a challenge, and our ego and our professionalism will make us say, 'oh yes of course I can cope'.

P1 or if you're clever enough you say 'no' really, I feel this [MHDC] is inappropriate'

P4 but that's tricky when you're trying to like, take care of the mother, trying to look after your colleagues, we're pulled in many directions, we shouldn't have that pull, it should be dealt with in the first instance, the mother goes to the appropriate place for appropriate care and then comes back to the appropriate place for appropriate care, even if it's in another area".

(FG/ Unit I / Band 6 / S1)

7.6 The impact of clinical guidelines and the ICS levels of care

The midwives used their knowledge of local clinical guidelines / protocols to validate their EoC decisions during some, but not all of the discussions. The Band 6 midwives of OU J referred to their EoC policy in relation to scenario one, although some of the Band 7 midwives favoured providing MHDC

P3: "The intensivists, that's in the escalation policy now. If they've had an abnormal blood picture they would be speaking with them just to give them the heads up so that they know the blood picture is abnormal. So, if she does then require to go over [to ICU], one of our criteria is severe HELLP or she needs a CVP line or art line monitoring, we can't keep her on the labour ward with those kind of things".
(Unit J / FG /Band 6 /S1)

The OU H midwives worked to an escalation protocol outlining the specific circumstances when a woman's care should be escalated to the ICU and, both Band 6 and 7 midwives appeared to adhere to it. Major obstetric haemorrhage and pre-eclampsia clinical guidelines were recognised and referred to during some of the focus group discussions, especially by the OU I midwives.

Clinical guidelines were not recognised or discussed during the scenario 3 focus groups, suggesting there were no specific guidelines available to influence the midwives' decision making when faced with this type of clinical scenario.

Across all 3 scenarios none of the midwives from OU H referred to the ICS levels of care whilst in contrast, a large number of OU I midwives did. The midwives of OU I were familiar with the ICS levels of care as they were required to complete a local proforma identifying women receiving higher levels of care as part of an ongoing local audit. They classed the woman in scenario 1 as receiving level 2 care but also referred to high dependency care on some occasions. The ICS levels of care were mentioned less by the midwives of OU J who frequently referred to women requiring labour ward

'HDU' on their individual questionnaires for scenarios 1 and 2. There appeared to be misunderstanding regarding how a level of care is classified during the OU J Band 7 (scenario 1), focus group discussions. The classification of care appeared to be associated with the need for involvement of specialists outside the fields of obstetrics and anaesthetics and did not accurately reflect the ICS standards.

P3: "It also depends on what level of HDU patient your organisation takes. So, our level one HDU might be very different to (name of another hospital)'s HDU, so they may take level two patients. So, I think it's about really about understanding what level HDU patient your unit accepts. Because HDU is a bit of a funny word." (FG / Unit J / Band 7 / S1)

and;

P6: "Our policy is around the umm, escalation of staff, so if it's a one team approach, so if it's just obstetrics but she needs more care than the obstetricians can provide, then we'd escalate her to level 2. P3: But if she needed care from an obstetrician and a general physician, or an intensivist, then that would go up to level 2 so our policy is really clear: If it's just obstetrics then we can look after her here and that includes anaesthetics as well. When we get above that level of care we would escalate it somewhere else". (FG / Unit J / Band 7 / S1).

7.7 Synopsis

This chapter has presented the findings of the Focus Group study and identified a number of factors that influence midwives' decision to either provide MHDC or request a woman's care be escalated away from the OU. Midwives working in the smallest OU did not have purpose designed facilities or equipment to provide MHDC. The proximity of the labour ward to the ICU also had an impact on midwives' EoC decision making, as did the availability of ICU beds. These were classed as fixed influences that were largely beyond the midwives' control.

Patient specific factors influencing the midwives' EoC decisions encompassed the clinical complexity of the woman, including her diagnosis and physiological stability, her perceived risk status, whether the woman was pregnant or her neonate was with her and aspects of her care plan i.e. staff to woman ratio, the level and type of monitoring and interventions required.

Professional issues that impacted on the midwives' EoC decisions included the labour ward staffing levels and skill mix, the workload and the level of internal and external support available to them. These were variable factors in the EoC decision making process. At times midwives, experienced impediments or barriers to the EoC process; these sometimes influenced their decision making or prevented seamless EoC. Clinical guidelines appeared to play a part in some but not all of the midwives' EoC decisions. Discussions regarding the focus group study findings are presented in chapter 9. The next chapter will discuss the findings of the Delphi survey.

Chapter 8 Discussion of phase one (Delphi Survey) findings

8.0 Introduction

The overarching aim of the Delphi survey was to address the research objectives as stated in section 1.4.1:

- Achieve a consensus on the defining features of MHDC (**section 8.2**).
- Obtain a consensus definition for MHDC (**section 8.3**).
- Examine whether the defining features of, and definition for MHDC are the same (or differ), for OUs that have differing annual birth rates (**section 8.4**).
- Examine whether the defining features of, and definition for MHDC are the same (or differ), for the professional groups of doctors and midwives working in OUs with similar annual birth rates (**section 8.5**).

This chapter will present a synthesis of the Delphi results that were presented in chapters 4,5, and 6, including discussion of the findings where consensus responses were and were not achieved (Keeney, Hasson & McKenna, 2011). Differences across OU / professional groups will also be discussed. The respondents combined for all 7 OUs will be referred to as the 'respondent group' henceforth.

8.1 Respondent characteristics and response rates

Selection bias regarding the characteristics of Delphi survey respondents has been identified as a potential threat to internal study validity (Keeney, Hasson & McKenna, 2011). The sample selection was robust as a random sampling procedure was used to identify the experts from the initial lists of potential respondents. The random sample of respondents were representative of the healthcare professionals providing midwifery and obstetric care in OUs with annual birth rates ranging from 1500-4500, further supporting the external validity of the study (Keeney, Hasson & McKenna, 2011).

However, the range of healthcare professionals was less well represented by individual OUs and this may have been influenced by the structure of medical staffing for example, as OUs E and G did not have obstetrics and gynaecology speciality training.

Whilst the Delphi survey first round response rate of 44% was slightly lower than anticipated, this could be attributed to it being a paper survey. It has been documented that paper survey response rates range between 32.6% and 75% (Nulty, 2008).

Strategies were employed to follow up the Delphi study first round non-responders (section 3.3.5.1) and this yielded n=24 respondents returning the questionnaire.

However, although the number of respondents increased by 24, the overall response rate of 44% did not change.

The characteristics and views of the non-responders may differ from the responders (de Vaus, 2002); this is termed 'selection effect' and may threaten the external validity of a study (Baker, Lovell & Harris, 2006; Rees, 1997). This issue needs to be taken into consideration when interpreting the results. The non-response rates for the second and third rounds were low suggesting that a 'downgrading' of information was unlikely to have occurred following the first round (Hsu & Sandford, 2007). It could be argued that the detailed analyses of the respondents' qualitative additional comments may be the reason why the stability of the panel was relatively high. The respondents may have 'recognised' their textual comments and the impact their comments had made on the development of the questionnaires, consequently felt their comments were valued and engaged with the Delphi survey. Furthermore the high response rates and low attrition rates between rounds two and three may reflect the respondents' interest in the topic of MHDC (Mullen, 2000).

The respondents were 'experienced' as evidenced by the length of time registered with their respective professional bodies, thereby increasing the likelihood they were familiar with the concept of MHDC. The relatively experienced profile of the midwives in this study reflects the current midwifery UK workforce (Centre for Workforce Intelligence, 2012; Chief Nursing Officers of England Northern Ireland Scotland and Wales, 2010). Almost 25% of the respondent group stated they had not undertaken any education or training specific to MHDC and the majority were midwives, supporting previous findings (Cockerill *et al.*, 2011; Saunders *et al.*, 2013).

8.2 The defining features of MHDC

The Delphi survey first research objective sought to identify the defining features of MHDC (section 1.4.1). Four defining features arose from the data; a group of conditions associated with and necessitating MHDC, the vigilance and interventions women receiving MHDC require and service delivery.

8.2.1 Conditions

8.2.1.1 Severe obstetric conditions

The familiarity and expertise that professionals acquire due to frequent or 'high volume' exposure to certain conditions, may explain why the respondent group agreed that women with hypertensive disorders of pregnancy and obstetric haemorrhage were suitable candidates for MHDC (Rotella *et al.*, 2014; Ryan *et al.*, 2000; Saravanakumar *et al.*, 2008; Sultan, Arulkumaran & Rhodes, 2013). These disorders are the most commonly cited reasons for MHDC (Kavanagh & Browne, 2015; Rajagopal *et al.*, 2011; Ryan *et al.*, 2000).

In contrast, AFE has an incidence of approximately 2 per 100,000 women (Knight *et al.*, 2010) and presents as an obstetric emergency due to sudden physiological

deterioration with hypoxia, hypotension and maternal collapse (Belfort *et al.*, 2010; Troiano, Harvey & Chez, 2013). Obtaining a definitive diagnosis for AFE may be challenging as it is a 'disease of progression' (Royal College of Obstetricians and Gynaecologists, 2011c). As midwives and doctors are trained to manage maternal collapse situations and provide emergency care, this may explain why the respondents agreed MHDC would be appropriate for a woman with a suspected diagnosis of AFE (Winter *et al.*, 2012). However, women with confirmed AFE may go on to develop pulmonary hypertension, left ventricular failure and coagulopathy requiring advanced respiratory / organ support (level 3 care) and intensivist expertise (Foley, Strong & Garite, 2014; Winter *et al.*, 2012), which may explain the consensus of opinion that these women require intensive care.

The proposition that staff working in smaller, low birth rate OUs are more likely to request the transfer of women to ICU, compared to those in larger OUs (Cordingley & Rubin, 1997; Scrutton & Gardner, 2012; Simpson & Barker, 2008) has been confirmed. The respondents of OU group 3 achieved consensus that severe obstetric conditions and suspected amniotic fluid embolism were indications for women to receive intensive care, as opposed to MHDC. Moreover, for women with these conditions it is significant that a higher proportion of midwives than doctors favoured transfer to ICU. This suggests it may be midwives who initiate local escalation of care decisions, as they are responsible for providing the immediate and continuing care required by women needing MHDC.

Although high-risk labour was agreed not to be an indication for MHDC in this study, the interventions that comprise 'routine' high risk care on the labour ward were agreed by the respondents as being integral aspects of MHDC. The administration of IV fluids, blood products, IV oxytocics, tocolytics and insulin equate with level 1 care (Maternal

Critical Care Working Group, 2011) which, according to Kuukasjarvi & Waite's (2012) labour ward audit in one teaching hospital, was the most frequent level of care provided (Kuukasjarvi & Waite, 2012). The prevalence of women requiring high risk, level 1 care could be a factor that explains why there can be overlap and interrelationship between level 1 and level 2 care, especially where the subtle clinical deterioration of a woman receiving level 1 care necessitates increased monitoring (Morrice & Simpson, 2007; Scrutton & Gardner, 2012).

It has previously been suggested that an alternative maternity specific level 0 care classification could be developed that differentiates between level 0 and level 1 care in OUs that acknowledges and takes into account the complexities of caring for women with high risk labours (James, Endacott & Stenhouse, 2011), but to date this recommendation has not been adopted within the OU setting.

8.2.1.2 Pre-existing conditions

Complex physiological changes occur during pregnancy to prepare the woman for the birth and accommodate the metabolic demands of the developing fetus (Chesnutt, 2004). As a result, women with comorbidities may require higher levels of surveillance and single or multiple organ support to treat physiological deterioration (Belfort *et al.*, 2010). Having a knowledge and understanding of these physiological adaptations elucidates why a high proportion of respondents agreed that women with pre-existing conditions in the presence of clinical instability required MHDC.

Morbid obesity, defined as a Body Mass Index (BMI) ≥ 40.0 (Centre for Maternal and Child Enquiries, 2010) was not cited as an indication for MHDC although the importance of individualised assessment for women and the increasing commonality

with which obesity is encountered was raised (Table 5-3) (Centre for Maternal and Child Enquiries, 2010).

8.2.1.3 Complications

Venous thromboembolism is a leading direct cause of maternal death in the UK whilst deaths from sepsis are increasing (Knight *et al.*, 2014; Lewis, 2004; Lewis, 2007).

These complications were agreed indications for MHDC across the respondent and OU groups. Guidelines aimed at reducing the risk factors associated with thromboembolic disorders and campaigns to improve outcomes for women with sepsis are widely publicised (Royal College of Obstetricians and Gynaecologists, 2015b; Society of Critical Care Medicine, 2015). As a consequence, these 'high profile' complications will be familiar to the respondents (Society of Critical Care Medicine, 2015). Whilst the incidence of antenatal PE is relatively low at 1.3 per 10,000 maternities (95% CI 1.1-1.5) (Knight and UKOSS, 2008) this risk increases during the postnatal period (Heit *et al.*, 2005; Royal College of Obstetricians and Gynaecologists, 2015b) and significant emphasis is placed on healthcare professionals recognising and acting upon the sign of symptoms of thromboembolism to prevent morbidity and mortality (Heit *et al.*, 2005; Lewis, 2007; National Institute for Health and Care Excellence, 2006 (updated 2015); Royal College of Obstetricians and Gynaecologists, 2015b).

Sepsis is a cause of maternal death in the UK (Centre for Maternal and Child Enquiries, 2011; Nair *et al.*, 2015; Shah *et al.*, 2014; Society of Critical Care Medicine, 2015) and treatment of sepsis will depend on the causative organism, degree of organ dysfunction and organ support required (Acosta *et al.*, 2014; Arulkumaran & Singer, 2013; Society of Critical Care Medicine, 2015). At the severe end of the sepsis spectrum women may require aggressive fluid therapy guided by pulmonary artery catheters, vasopressor / inotrope therapy and invasive ventilation, reflecting level 3 care (Foley, Strong & Garite, 2014; Intensive Care Society, 2009). Accordingly, a

proportion of respondents maintained that women with severe sepsis will require intensive care.

Acute surgical complications (e.g. peritonitis / bowel obstruction) are rare complications that can develop post LSCS (Bonney & Myers, 2011; Drukker et al., 2016; Newton, 2008). Although the respondents agreed these to be indications for MHDC, their comments reinforced that transfer to ICU would be required where physiological instability was present. The presence of physiological instability also corroborates why the complex disorder of DIC, often indicative of maternal physiological deterioration secondary to major obstetric haemorrhage and sepsis achieved consensus in favour of intensive care (Belfort *et al.*, 2010).

8.2.1.4 Physiological instability

The majority of respondents viewed the presence of ongoing physiological instability as an indication for intensive care, reflecting the assertion that care in the ICU is required for women “whose conditions are life threatening” (Martin and Hutchon, 2008, p 954). The care required by women suffering from physiological deterioration will depend on the underlying cause and the degree and type of organ support required (Sheffield, 2004).

Unresolved physiological instability is associated with increased severity of illness, and higher patient acuity necessitating complex haemodynamic monitoring and more active treatments outside the facilities within OUs (Maternal Critical Care Working Group, 2011; Wilmot, 2010). Timely intervention will optimise patient outcomes and “can alleviate progression of organ dysfunction” for the deteriorating patient (Wheatley, Farkas & Watson, 1996, p.223). The respondents saw a willingness to transfer women to ICU and involvement of intensivists as a feature of MHDC. Justifying the recognition

for safe clinical practice, this suggests that professional recommendations made over the years (e.g. Lewis, 2004; Lewis, 2007) are integral to professionals' clinical practice.

It is notable that the respondents in this Delphi survey focused strongly on the conditions that necessitate MHDC. In accordance with contemporary recommendations (ICS, 2009), it is suggested there is a need to realign healthcare professionals' focus towards the need for organ support, in an attempt to standardise the classification of MHDC.

8.2.1.5 Emotional psychosocial

Whilst there was consensus that women with puerperal psychosis require perinatal mental health services as opposed to MHDC, the problems accessing this type of specialised care were raised. Lack of uniform service availability across the UK has been identified by the Royal College of Psychiatrists, despite recommendations in the 6th report of the Confidential Enquiries into Maternal Deaths report that all women should have access to specialist services (Lewis, 2004; Royal College of Psychiatrists, 2015). The inconsistent service provision related to puerperal psychosis (Healthcare Commission, 2008) may clarify why at least 50% of the respondents agreed that women with severe mental health issues would require MHDC and suggesting that maternity services may be required to utilise their MHDC provision to compensate for inaccessibility of specialist services.

8.2.2 Vigilance

8.2.2.1 Observation and monitoring

Level 2 patients require a minimum of hourly observations (ICS, 2009), and there was consensus that vital signs recorded less than hourly and / or continuously were a feature of MHDC. Although ECG monitoring, neurological observations and invasive

monitoring using CVP and arterial lines were viewed as features of MHDC by many of the respondents (Ryan *et al.*, 2000; Saravanakumar *et al.*, 2008; Whitworth *et al.*, 2016), midwives representing the OUs with the lowest annual birth rates agreed that intensive care was indicated. This may be an indication that midwives in smaller OUs do not have the appropriate equipment or skills to care for women requiring these types of monitoring (Cordingley & Rubin, 1997; Sultan, Arulkumaran & Rhodes, 2013).

Swan Ganz monitoring was agreed to be an indication for ICU admission and reflects the respondents' recognition of the complexities and complications associated with this type of monitoring which, is indicated for the sickest patients (Carlin & Alfirevic, 2008; Martin & Hutchon, 2008; Pacheco, 2008). However, it is inconsistent as to why midwives in OU group two did not achieve consensus regarding women requiring Swan Ganz monitoring needing intensive care. This unexpected finding cannot be explained and has received no attention in the published literature to date

There was consensus by the respondent group that EWSs should be used for all women receiving MHDC. However, differing opinions as to when and where these systems should be employed were apparent; a finding supported by the work of Issacs *et al.* (2014) and Mackintosh *et al.* (2014) who identified similar discrepancies in their studies. The ability of professionals to detect physiological deterioration in a woman who is receiving MHDC cannot be overlooked, as further EoC to a higher level may be required in order to prevent failure to rescue situations (Centre for Maternal and Child Enquiries, 2011; Lewis, 2007; National Institute for Health and Clinical Excellence, 2007). Following the introduction of a high dependency chart with an integrated EWS, a small single site retrospective audit concluded that for the care of women with severe pre-eclampsia (n=22), there was improved control of hypertension and apposite fluid restriction (Ryan *et al.*, 2012). Whilst the findings of this study cannot be generalised

due to the very small sample size and retrospective analyses of the data, it indicates the use of EWS positively influences MHDC provision at a local level. Robust research is required with a larger sample in a multicentre setting to confirm the effectiveness of high dependency charts with integrated EWSs in the OU setting.

8.2.2.2 Staff to patient ratio and staff presence.

The respondent group and two of the OU groups cited 'one to one' care with a professional in constant attendance' as a characteristic of MHDC. This staff to woman ratio is advocated for women receiving MHDC when in individual rooms, a normal clinical requirement within UK labour wards (Association of Anaesthetists of Great Britain & Ireland and the Obstetric Anaesthetists' Association, 2013). However, this ratio does not reflect the general literature suggesting lower staff to patient ratios may be acceptable for patients receiving high dependency care (Garfield, Jeffrey & Ridley, 2000).

8.2.2.3 Medical review

Regular medical reviews of the woman and joint lead clinicians (consultant obstetricians and consultant anaesthetists) were agreed features of MHDC in accordance with published evidence from working groups and professional recommendations (Lewis, 2004; Lewis, 2007; Maternal Critical Care Working Group, 2011; Saunders *et al.*, 2013). Cohesive multidisciplinary team working is a fundamental component of safe effective maternity care when complications arise, preventing miscommunications and clinical mismanagement (Guise & Segel, 2008; Leonard, Graham & Bonacum, 2004; Lewis, 2004; Lewis, 2007). A joint leadership approach utilises the different skills that obstetricians and anaesthetists bring to MHDC provision (Martin & Hutchon, 2008; Plaat & Wray, 2008).

8.2.2.4 Investigations and record keeping

As anticipated, increased and frequent investigations e.g. blood tests, ABG analysis and imaging were agreed to be integral aspects of MHDC, as these provide clinicians with information related to the physiological status of an acutely ill woman and will guide her treatment plans (Dutton, 2012).

Record keeping, including the use of high dependency charts for the acutely ill woman is integral to clinical practice, a professional requirement and, a means of coordinating and communicating care (Nursing and Midwifery Council, 2015a). The use of electronic charts termed Clinical Information Systems (CIS) are commonly used in ICU. These charts collate laboratory results, physiological parameters, routine documentation, have in built decision support systems and facilitate severity of illness scoring (Plenderleith, 2013; Saarinen & Aho, 2005; Shabot & Gardner, 1994). These systems were advocated by a small proportion of respondents. However, it is unknown if these systems are used on labour wards for the care of acutely ill women, although decision support systems specifically for electronic fetal monitoring interpretation are more widely used (Georgieva et al., 2011). It could be argued that healthcare professionals familiar with the fetal monitoring decision making systems may easily adapt to the CIS used in ICUs, but these are costly to implement (Plenderleith, 2013).

8.2.3 Interventions

8.2.3.1 Step down care

Step down care, classed as level 2 care (ICS, 2009) is appropriate for patients no longer requiring intensive care, though still requiring a level of monitoring and / or intervention that cannot be provided in the general ward area (Vincent & Rubenfeld, 2015). It has been suggested that step down care negates inadequate care provision due to staff not having the necessary equipment, skills or capacity to provide safe care

(Stacy, 2011; Vincent & Rubenfeld, 2015). In relation to midwifery and obstetric care, step down care may be advantageous on antenatal / postnatal wards where midwives are unable to provide adequate care for women with high acuity levels due to low staff to patient ratios and heavy workloads (Beake et al., 2010). In part, this may be an explanation why the majority of respondents achieved consensus that step down care is an indication for MHDC.

For a woman who has required care on an ICU, step down care may be crucial in aiding her physiological and psychological recovery, and if she has been separated from her infant, the mother baby relationship will be established (Billington & Stevenson, 2007; Hinton, Locock & Knight, 2015). It has been argued that step down care may limit the potential for, or impact of, relocation stress defined as “physiologic and/or psychological disturbance following transfer from one environment to another” (Carpenito, 2013). In patients transferred from ICUs to the general ward environment step down care provides ‘intermediate care’ from high levels of intervention and close surveillance provided on an ICU and the reduced care provided on the general ward (Mc Kinney & Melby, 2002).

A recent UK qualitative study using semi-structured interviews to examine the experiences of women suffering “life-threatening complications in pregnancy” identified that some women transferred from ICU to the postnatal ward felt staff had limited comprehension of what they had experienced whilst receiving critical care and stated they had feelings of abandonment (Hinton, Locock & Knight, 2015). Similar findings have been identified in qualitative studies exploring the experiences of non-pregnant patients following discharge from ICU to general wards (Cullinane & Plowright, 2013).

Currently, there is no published literature regarding the numbers of women who receive step down care on labour wards and further research is required at local and national level to examine this aspect of care in the context of MHDC.

8.2.3.2 Post operative care

There was absence of consensus across the respondent group for the statement 'immediate post operative care does *not* constitute MHDC'. The lack of consensus agreement by the midwives may, in part, be attributed to their role in providing post anaesthesia care which, involves the frequent monitoring of a woman's vital signs and continuous one to one care (Whitaker et al., 2013), commensurate with agreed features of MHDC as reported in this study. The LSCS rate in England for the period 2014-2015 was 26.5 % (n=166,319) suggesting the provision of post-operative care in OUs is common (Health and Social Care Information Centre, 2015). Women may also require postoperative care following manual removal of placenta, examination under anaesthetic and repair of complex perineal trauma (National Institute for Health and Care Excellence, 2014a). The variations in the respondents' responses may be attributed to the differences in service provision across OUs with some utilising nurses to provide immediate post operative care and others utilising appropriately trained midwives (Association of Anaesthetists of Great Britain & Ireland and the Obstetric Anaesthetists' Association, 2013).

The midwives across all 3 OU groups achieved consensus agreement that prolonged post operative care > 24 hours was an indication for MHDC whilst the doctors did not; which may be an indication that midwives and nurses are the primary care givers in this area. Extended post-operative care is classed as level 2 care (ICS, 2009), but it is not clear what constitutes 'extended'. Expert opinion suggests this type of care may be required for a variety of reasons including difficulties in achieving adequate pain

control, respiratory complications including the need for facial oxygen to maintain normal oxygen saturations, and haemodynamic instability (Sewell & Young, 2003). Nonetheless, there is an absence of contemporary published data nationally identifying the percentage of women requiring extended post-operative care after LSCS section or other obstetric procedures suggesting a need for further investigation in this aspect of maternity care.

8.2.3.3 Care planning

Care planning was not agreed to be a component of MHDC, despite recommendations for clear management plans to be recorded for women with complex pregnancies to ensure seamless care provision across all members of the MDT (Royal College of Anaesthetists *et al.*, 2007). Respondents suggested this was part of 'normal' care for all women irrespective of their clinical circumstances or needs.

8.2.3.4 Multidisciplinary referral and transfer

The majority of respondents agreed that referral to specialist medical staff, the CCOT and ICU were components of MHDC. This highlights their recognition of the importance of accessing specialist knowledge and expertise when caring for acutely ill women and confirms the importance that multidisciplinary referral contributes to the safety culture in organisations (Knight *et al.*, 2015; Sutker, 2008). The CCOT has previously been reported as a mechanism for supporting ward staff to care for acutely ill patients (Chellel, Higgs & Scholes, 2006) thereby promoting safe care.

In this study the role of paramedical staff including physiotherapists, ODPs and registered general nurses (excluding critical nurses) were not strongly regarded as part of the wider MHDC support network, despite their expertise in caring for acutely ill patients (Gupte & Swaminathan, 2016; Patil, Jigajinni & Wijayatilake, 2015). This finding may reflect the variations in local MHDC provision and limited understanding

and exposure that midwives especially, may have regarding the skills and roles of these professional groups (Robinson & Straughan, 2014). Importantly, there was agreement that the transfer of a woman to a specialist area, or higher level of care, was an integral aspect of MHDC as this is a factor that can reduce or prevent SMM and mortality (Lewis, 2007; Maternal Critical Care Working Group, 2011).

8.2.3.5 Treatments

The administration of IV anticonvulsants (e.g. magnesium sulphate) and IV antihypertensive therapy were agreed components of MHDC. The Maternal Critical Care Working Group (2011, p.6) cites the administration of a magnesium sulphate infusion to control eclamptic seizures as an example of level 2 care, although its administration for seizure prophylaxis is currently not recognised as level 2 care. This anomaly has been questioned by Wheatly (2010) and more recently, this 'prophylactic' treatment has been cited as an example of level 1 care (MacLennan, O'Brien & Macnab, 2016). It has also been highlighted that because of these discrepancies some women will not be included in the CCMDS (Roberts et al., 2012).

It is well documented that poorly controlled hypertension can lead to intracranial haemorrhage, and systolic BP values over 160mmHg must be treated as an obstetric emergency (Centre for Maternal and Child Enquiries, 2011; National Institute for Health and Care Excellence, 2010; Winter *et al.*, 2012). It is unclear why fewer midwives than doctors representing OU groups 2 and 3 viewed IV antihypertensive administration as an indication for MHDC, as this group of women would be candidates for MHDC (Winter *et al.*, 2012).

The respondent group agreed that intensive care was the preferred option for women requiring inotropes and vasopressors. These medications are primarily administered to

women with physiological instability at the severe end of the illness spectrum, reflecting the respondents' propensity to transfer women with unresolved physiological instability to ICU (Benham-Hermetz, Lambert & Stephens, 2012). Only the midwives representing OU group 2 did not achieve consensus in favour of intensive care and it is unknown why this group of midwives did not, identifying the need for further exploration of this aspect of MHDC within specific OUs.

Only the midwives of OU group 3 achieved 100% consensus in favour of women needing drugs and / or fluids via a central line requiring intensive care reflecting previous propositions that smaller OUs are poorly equipped to provide this level of care (Cockerill *et al.*, 2011; Cordingley & Rubin, 1997).

The administration of 50% or more oxygen via a facemask to maintain oxygen saturations is a feature of level 2 care (Maternal Critical Care Working Group, 2011, p.6). This statement led to variable opinions as to whether this form of treatment is an indication for MHDC or intensive care, with no consensus being achieved for MHDC in the second round and no consensus for ICU in the third round. Respiratory failure may be caused by oxygenation failure (Type 1) or ventilatory failure / hypercapnic failure (Type 2) (Mishra & Modi, 2013; Moore & Woodrow, 2009). The aetiology of respiratory failure is complex and multifactorial (Price, Slack & Nelson-Piercy, 2008; Van de Velde, Scholefield & Plante, 2013) which may explain why the respondents were unable to take a definitive stance on the most appropriate location for care for women with respiratory failure.

8.2.3.6 Regional pain relief

The statement 'a woman receiving epidural anaesthesia for postnatal pain relief will *not* be classed as receiving MHDC' evoked varying opinions amongst the respondents.

The intrapartum epidural rate for women receiving only epidural analgesia stands at 16.4% according to 2015 Hospital Episode Statistics, but the data may be an underestimate as they exclude women who receive additional forms of pain relief (Health and Social Care Information Centre, 2015). Although there is some available data, this finding highlights the need for detailed investigation of UK postnatal epidural rates.

Patient controlled epidural analgesia may be used to relieve a woman's pain following LSCS (Bilir, 2013; Mkontwana & Novikova, 2015; National Collaborating Centre for Women's and Children's Health, 2011; Woods et al., 2012). This intervention is classed as level 1 care, and may reflect the respondents' tendency to agree it was not an indication for MHDC. The respondents' differing opinions may be a consequence of local variations in methods of postnatal pain relief, and midwives' familiarity with this specific method.

8.2.3.7 Complex treatments

The respondents achieved consensus in favour of intensive care for women requiring the complex interventions of non-invasive ventilation (e.g. CPAP / BIPAP), tracheal intubation and ventilation, and renal support. Although non-invasive ventilation is classed as level 2 care, it is an infrequently encountered intervention in OUs (Draisci et al., 2013; Erdogan et al., 2010; Intensive Care Society, 2009). Non invasive ventilation is under researched in terms of its effectiveness for the obstetric patient, and it has been suggested to be used as a 'trial' treatment administered on an ICU for the acutely ill woman, but requires robust evaluation (Price, Slack & Nelson-Piercy, 2008). Case studies suggest that NIV can be successfully used in the treatment of women with comorbidities such as diabetes and morbid obesity and in the treatment of pneumonia and pulmonary oedema secondary to tocolysis (Djibré et al., 2010; Draisci *et al.*, 2013;

Erdogan *et al.*, 2010). There is, however, currently no data to determine how widely NIV is used to treat acutely ill women in the OU setting as opposed to an ICU.

The respondents in this survey did not differentiate between women requiring short term or longer term tracheal intubation and ventilation. Invasive ventilation may be undertaken where there is altered consciousness, apnoea, or haemodynamic instability and is classed as level 3 care (Belfort *et al.*, 2010; Intensive Care Society, 2009).

Women may require intubation and ventilation on the labour ward when used as part of obstetric emergency management (Winter *et al.*, 2012). Whilst this intervention may be clinically indicated in OUs during emergency situations, longer term mechanical ventilation for those women with hypoxic respiratory failure, hypercapnia respiratory acidosis or unstable airways are likely to be cared for on the ICU (Lau *et al.*, 2015; Van de Velde, Scholefield & Plante, 2013).

Renal support therapies include intermittent haemodialysis, continuous haemofiltration and peritoneal dialysis, and these are used to treat acute kidney injury (AKI) (Booker, 2015). The choice of therapy will be dependent on the underlying reason for the AKI. The equipment and expertise required for these interventions fall within the remit of the intensivist and ICU team (Bhakta, 2012; Vaughan *et al.*, 2010) and the respondents opinions in this study reflected these recommendations.

8.2.3.8 General maternity care

The majority of respondents agreed that women require routine physical care and psychological / family support as part of MHDC (Billington & Stevenson, 2007). This finding reflects best practice for all women requiring maternity care irrespective of the type of care they are receiving (Department of Health, 2004; Department of Health, 2007). Moreover, there must be a balance between physical and psychological

support, as a qualitative study suggests that women receiving MHDC reported that healthcare professionals prioritised the physical aspects of their care over the emotional ones (Bassett, Bick & Sandall, 2016).

Qualitative studies conducted in Brazil, Sweden and the UK highlight that women require comprehensive information and compassionate support from their caregivers when life threatening complications associated with childbearing are experienced (Engström & Lindberg, 2011; Hinton, Locock & Knight, 2014; Hinton, Locock & Knight, 2015; Souza et al., 2009). The agreement that general maternity care is a defining feature of MHDC also suggests the respondents viewed the concept holistically (Goebel, 2004).

8.2.4 Service Delivery

The facilities and equipment available to staff, professional aspects such as skill mix on the labour ward and the importance of clinical guidelines were viewed as integral aspects of MHDC provision by the respondents during the Delphi survey first round. The Focus Group study was designed to examine whether / how service delivery influences midwives' decisions to provide MHDC or escalate care away from the labour ward, given it appeared to be the midwives in the smaller OUs that were more likely to suggest a woman be transferred to ICU. These findings are discussed in chapter 9.

8.3 A consensus definition for MHDC

Over the course of the Delphi survey three rounds, the respondent group and both professional groups, agreed upon a definition of MHDC.

“an interim level of care for women requiring interventions over and above the [specialised] ‘high risk’ obstetric care that will be carried out routinely on

a consultant led labour ward, but not requiring care on an intensive care unit. It will be implemented where a woman has deteriorated clinically but her care can be managed appropriately on the labour ward. It is more likely to be undertaken for maternal than fetal reasons”

This definition has similarities to that provided by Martin and Hutchon (2008, p954) who define high dependency care as “a standard of care between the general ward and full intensive care”. It also equates with a definition for ‘step up care’ where patients are transferred to a higher level of care from a ward area or Emergency Department due to “acute clinical changes” not requiring intensive care (Prin & Wunsch, 2014, p.1212). The definition is not absolute, as the phrase ‘can be managed appropriately on the labour ward’ reflects local variations.

Despite the introduction of the ICS (2002, 2009) ‘levels of critical care for adults’ classification system, in this study, two thirds of the respondents were unfamiliar with these levels of care. There may be reticence to adopt the ICS levels of care because, as suggested in section 2.2.1, a proportion of maternity specific examples provided by the Maternal Critical Care Working Group (2011) are open to interpretation. It could also be argued that the long timeframes required to integrate new guidance into clinical practice (Blair, 2014) has not facilitated the adoption of the levels of care in the specific and specialist cohort of acutely ill pregnant / post natal women. Where professional differences exist regarding the comprehension of, and / or terminology used in clinical practice, there is increased potential for miscommunications which may increase the likelihood of adverse clinical incidents (Cook, Render & Woods, 2000; Manser, 2009; Watson et al., 2016).

Although there was consensus agreement that MHDC equated with level 2 care across all 3 OU groups (Scrutton & Gardner, 2012; Vaughan *et al.*, 2010; Wheatly, 2010), the

respondents of OU group 3 agreed that level 1 care equates with MHDC confirming expert opinion and a prospective service review that there are local variations in the definition (Price, Slack & Nelson-Piercy, 2008; Scrutton & Gardner, 2012; Williams *et al.*, 2015). The findings of the Delphi survey suggest that MHDC encompasses a combination of care levels in some OUs, and as a consequence some women will have low acuity levels (Pollock, Harley & Nelson, 2011).

Evidence published 30 years ago suggests that some women receiving MHDC may fall into a category of patients described as “low risk monitor (LRM) patients” who are suitable for high dependency care (Wagner, Knaus & Draper, 1987). The authors, Wagner, Knaus and Draper (1987) stratified American patients into 3 groups: those requiring ‘active treatments’ normally provided in an ICU, high risk monitor (HRM) patients and low risk monitor (LRM) patients. Thirty-one active treatments were identified from the TISS and variables from the APACHE II system were used to calculate statistical risk estimates for patients requiring active treatment. HRM patients were those calculated to have a > 10% risk of requiring active treatments compared with a < 10% risk for LRM patients (Wagner, Knaus & Draper, 1987).

However, the validity of this risk classification system has been largely dismissed for use in the UK as some of the active intensive care treatments specified may be provided outside of the ICU (Pappachan *et al.*, 1999). Moreover, it has been determined that whilst APACHE II has good discriminatory function³, it overestimates the probability of death (Bouch & Thompson, 2008; Harrison *et al.*, 2005; Lapinsky *et al.*, 2011; Vasquez *et al.*, 2007). It is proposed that this overestimation may occur due

³ Discrimination refers to the ability of a model to distinguish between which patients will be survive and those that will not. Discrimination is described by the area under the receiver operator curve. 0.5% represents chance and 1.0 is a perfect prediction (Hall, Schmidt & Wood, 2005)

to the altered physiology of pregnancy, the healthiness of many pregnant women and, lower ICU admission thresholds for this cohort (Harrison *et al.*, 2005).

Although the respondents in this survey agreed that high-risk labour on its own was not an indication for MHDC, they acknowledged that some components would be used during MHDC provision. This 'overlap' of components may justify the respondents' blurring of boundaries between level one and level two care. Many of these treatments, including blood transfusions, tocolytics and insulin infusions will be administered routinely on the labour ward, but will also be administered during obstetric or medical / surgical emergencies when a woman's level of care may shift from level 1 to level 2.

8.4 Are the defining features of, and definition for MHDC the same for OUs with differing annual birth rates?

The third research objective aimed to examine whether the defining features of, and definition for MHDC were the same (or differed), for OUs with differing annual birth rates. Some of the defining features of MHDC were different for the respondents of OU group 3 who agreed that women with certain conditions and monitoring necessitated intensive care and these were not features of MHDC. This reflects the findings of dated evidence and expert opinion suggesting local variations exist in the provision of MHDC (Cordingley & Rubin, 1997; Scrutton & Gardner, 2012; Simpson & Barker, 2008; Vercueil & Hopkins, 2015).

The highest transfer rate of acutely ill women to ICU in Cordingley & Rubin's (1997) dated survey undertaken 20 years ago was noted for OUs with annual birth rates of 1000-1999 (median 1.84 per 1000 deliveries, range 0 - 5.52), and transfer rates gradually fell as the annual birth rate increased (2000-2999, median 1.45; 3000-3999 median 1.1.7; 4000-4999 1.00) (Cordingley & Rubin, 1997, p.158). Similar findings

have been reported more recently in the Netherlands, (Zwart et al., 2010) however the organisation of healthcare services are similar but not identical to those of the UK and therefore should be viewed with caution.

Varying definitions for MHDC may lead to inequitable care provision for acutely ill women (Williams *et al.*, 2015) and the admission of relatively low acuity patients to ICU may have a deleterious impact on those with greater need for higher levels of care (DeVita, Hillman & Bellomo, 2011; Marsh & Pittard, 2012; Pattison & O'Gara, 2014; Stelfox et al., 2012). Moreover, the detrimental effect of early escalation to the ICU on the mother baby relationship should not be discounted.

8.5 Are the defining features of and definition for MHDC the same for the professional groups of doctors and midwives who work in OUs with similar annual birth rates?

Whilst there were some differences of opinion between the responses provided by the doctors and midwives working in OU groups 1 and 2, more variations were evident in OU group 3, particularly when EoC to the ICU was offered as an alternative to MHDC. It is not known how midwives' and doctors' differing perceptions of MHDC manifest in the OU setting on a day to day basis or whether these differing opinions are mediated by team interactions utilising a collaborative approach to decision making (Hastie & Fahy, 2011). Patient safety is enhanced when members of a team possess a common understanding regarding a task, the objectives they wish to achieve and the processes that will be used to meet these objectives (Dekker, 2011; Fortune *et al.*, 2013; Gonzalez & Yukihiro, 2013; King's Fund, 2008). Collectively these factors comprise shared mental models or team mental models (Burtscher & Manser, 2012; Vincent, 2010) which have been identified as underpinning cohesive team working across a range of settings (Castellan, 2009; Van den Bossche et al., 2011).

It has been suggested that different facets of team mental models exist and include mental models related to *tasks* and to the *team itself* (Mathieu et al., 2000). Task mental models encompass “technology / equipment and the job / task”, whilst team mental models include team aspects such as “team interactions”, and ultimately these influence team process and performance (Mathieu *et al.*, 2000 p. 274). The findings of the Delphi survey suggest that the midwives’ task mental models did not equate with those of their medical colleagues in relation to certain facets of MHDC such as the provision of invasive / ECG monitoring. These issues may be described as gaps, or ambiguities and can lead to adverse clinical incidents unless they are investigated and addressed. Further research examining these concepts in relation to MHDC has the potential to highlight issues that may subsequently be resolved, with the aim of increasing patient safety.

8.6 Synopsis

The first research objective sought to gain consensus on the defining features of and definition for MHDC. A comprehensive list of conditions was agreed to be synonymous with MHDC. The commonality of the condition, the professionals’ concomitant expertise in managing the condition and a woman’s level of physiological stability influenced whether MHDC could be provided, reflecting the literature. It has been identified that for women with puerperal psychosis, MHDC may be provided in some OUs in the absence of specialist facilities.

The second theme of vigilance highlighted the importance respondents placed on physiological monitoring as a feature of MHDC. However, the respondents also adopted a well-balanced approach in that they agreed regular medical reviews, investigations and record keeping were also key characteristics, commensurate with safe practice. The third theme of interventions was extensive and included those features the respondents

agreed as specific to MHDC (e.g. step down care (8.2.3.1), treatments (8.2.3.5)) and also those that were more generic, such as general maternity care (8.2.3.8). This suggests the respondents perceived MHDC in a more 'holistic' manner than is often presented in the literature which may reflect the midwifery input with this research. Features, including post operative care and regional anaesthesia did not achieve consensus opinion as features of MHDC and may reflect the way local services are provided.

The Delphi survey second study objective sought to gain a consensus definition for MHDC; the subjective definition agreed upon by the respondents shares similarities to those from the wider literature on general high dependency care in many respects. Using objective criteria, the respondents equated MHDC with level 2 care although the number of professionals who were aware of this classification system was relatively low and, some equated it with level 1 care.

The third research objective aimed to examine whether the defining features of, and definition for MHDC were the same (or differed), for OUs with differing annual birth rates, and variations were apparent in relation to the OU group with the lowest annual birth rates (group 3). This suggests local variations do exist as documented in the literature. The most noticeable differences of opinion between the doctors and the midwives occurred in the same OU group, where midwives had lower thresholds for transferring women to ICU as opposed to providing MHDC (research objective four). This is a finding that was corroborated in the Focus Group research and these findings are discussed in chapter nine.

Chapter 9 Focus Group Study discussion and integration with the Delphi Survey findings

9.0 Introduction

The Focus Group research was developed to explore the factors that influence midwives' decisions to provide MHDC or escalate a woman's care away from the labour ward. The Focus Group research objectives structure this chapter:

- To determine if local service delivery has an impact on a midwife's decision to provide MHDC or request care escalation (**section 9.2**)
- To ascertain if patient specific factors influence midwives to provide MHDC or request care escalation (**section 9.3**)
- To examine if professional issues impact upon care escalation decisions (**section 9.4**)
- To determine whether clinical guidelines and / or other factors influence a midwife's decision to provide MHDC or request the escalation of care (**section 9.5**)

Where applicable, the findings of the Delphi survey will be integrated into the discussions.

9.1. Characteristics of the focus group participants

The majority of midwives who participated in this study had been qualified for considerable lengths of time (Table 7-1) and were self-selected to participate. Consequently, they may not be representative of the population of midwives employed within the OUs included in this study. Each focus group was designed for 6-8 midwives but due to staffing levels and midwives' workloads / other commitments this was not always achieved. The smallest focus group was attended by 3 midwives and can be classed as a mini focus group (Krueger & Casey, 2009). The largest focus group

included 9 midwives (Unit I Band 7), one of whom was a Band 8 matron; however, as this midwife worked some clinical shifts on the labour ward it was decided it was appropriate for her to be included.

The midwives representing the smallest OU had received no local education or training to provide MHDC (Simpson & Barker, 2008). By contrast, the majority of the Band 7 midwives from OU I had been on an in house high dependency training course (Martin & Hutchon, 2008). However, less midwives from the largest OU had received relevant MHDC education and training, consistent with other findings (Cockerill *et al.*, 2011; Saunders *et al.*, 2013).

9.2 The impact that service delivery has on a midwife's decision to request care escalation.

9.2.1 Facilities and equipment

Corroborating the Delphi survey findings and previous published evidence, the midwives of the smaller OU did not have the specialist equipment to provide all aspects of MHDC and had no choice but to escalate the care away from the OU when an acutely ill woman required invasive monitoring (Cordingley & Rubin, 1997; Saunders *et al.*, 2013). This may be regarded as a judicious organisational decision, where managers have acknowledged the infrequency with which women requiring higher levels of care in smaller OUs are encountered, as well as the significant outlay of resources that would be needed to service this specialist care (Cordingley & Rubin, 1997; Vercueil & Hopkins, 2015). In the OUs where MHDC was provided, a lack of appropriate equipment, as described by only one midwife, has the potential to hinder care provision (Ford, 2010; Gurses & Carayon, 2007).

9.2.2 Proximity of the labour ward to specialist areas

The proximity of the labour ward to the ICU had some influence the midwives' EoC decisions. Long transfer distances have been recognised as factors that may contribute to substandard perinatal / maternal care (Sadler et al., 2013). In OU J, the midwives perceived the closeness of the ICU to the labour ward as a 'safety net' when providing MHDC, because specialist help was readily available if needed. This finding has not previously been reported in the published literature. Conversely, due to the substantial transfer distance between the onsite ICU and labour ward, the midwives of OU H made their EoC decisions 'early' to take this factor into consideration. This OU was separate to, but on the same site as the ICU, classed as "split site" and "isolated" (Marstin et al., 2012, p.99). This type of geographical 'isolation' has been recognised as a potential source of delay when multidisciplinary assistance or transfer is required (Marstin et al., 2012, p.99).

The risks associated with the transfer of a physiologically unstable woman to ICU were influential for the midwives of OU I (section 7.3.2). This OU was also classed as split site, but with a direct link to the ICU via a number of long corridors, in contrast to OU H, where there were no direct links to ICU and ambulance transfer was required (Marstin et al., 2012, p.99). Adverse incidents occurring during intra hospital transfer of critically ill adults may include clinical factors such as further physiological deterioration (Fanara et al., 2010). The involvement of the CCOT has been promoted as a measure to enhance maternal safety when undertaking intra hospital transfer of obstetric patients, as team members will possess the necessary critical care expertise to minimise or manage the risks that arise (Barrett & Yentis, 2008), although involvement of the CCOT was sought predominantly by the midwives of OU H.

9.2.3 Bed availability on specialist units

The UK has a low ICU bed density in comparison to other countries i.e. Germany and the USA (Wild & Narath, 2005). In July 2016, of the 4022 critical care beds in England, the bed occupancy rate was 82.6% (NHS England, 2016b). The midwives of OU H were proactive in liaising with the ICU staff when there was the potential for transfer of an acutely ill woman. However, a three year retrospective audit conducted in a Welsh tertiary referral centre identified that only 40% of the women admitted to the ICU from the OU were “predictable”; these women had comorbidities or were planned elective admissions (Chandrasekaran & Basu, 2007). However, the findings of this audit may not be applicable or representative of smaller District General Hospitals which will refer some women to tertiary referral centres. Other retrospective studies conducted outside of the UK suggest higher rates of unpredictability, although the characteristics of the local case mix and the organisation of critical care services will influence the findings (Mirghani *et al.*, 2004; Paxton, Presneill & Aitken, 2014).

All OUs have a fully equipped operating theatre that enables higher levels of care to be initiated by anaesthetists and obstetricians so that emergency / temporary MHDC can be initiated until the transfer of a woman to intensive care can be undertaken (Barrett & Yentis, 2008; Lewis, 2007; Royal College of Anaesthetists *et al.*, 2007). This practice was reported by the midwives of OU I (section 7.3.3). There is currently no national guidance specifying the length of time that higher levels of care can be provided in the obstetric operating theatre.

Expert opinion suggests that OUs with an annual birth rate over 4000 should have 2 operating theatres, whilst smaller OUs may use a birthing room as a second emergency back-up theatre (Royal College of Anaesthetists *et al.*, 2007). This requirement may influence the provision of MHDC on the labour ward in smaller OUs

as MDHC provision will be dependent on the necessary anaesthetic equipment being available in the back-up theatre. It has been found that some service providers may opt to utilise an operating theatre in the general hospital or a recovery room to provide MHDC in an emergency situation (Rawal *et al.*, 2008).

9.3 The patient specific factors that influence midwives' decisions to request care escalation.

The midwives' discussions regarding the 3 scenarios in this study mirrored the process of real-time situational awareness (Fore & Sculli, 2013; Parush *et al.*, 2011).

Interestingly, the future predictions as to the clinical needs and potential outcomes of the women in the 3 scenarios were discussed by the midwives (section 7.4.3), which reflects their clinical proficiency and expertise (Benner, 2001; Thompson & Dowding, 2009). The patient specific factors influencing midwives to provide MHDC or escalate care are discussed in sections 9.3.1.1 – 9.3.4.

9.3.1 Clinical Complexity

9.3.1.1 Diagnosis

As highlighted during the Delphi survey, familiarity with common obstetric conditions determined that the midwives felt competent to provide MHDC. Conversely, in the absence of a definitive diagnosis in scenario 3, some midwives were reluctant to make EoC decisions, whilst others were keen to transfer the woman away from the labour ward once she had been deemed 'obstetrically well'. Moreover, a general reluctance on the part of the midwives to provide care for a woman with a cardiac condition was apparent. This confirms the results of research that suggests doctors are more inclined to escalate care if they are unfamiliar "with a patient's clinical problem" (Rotella *et al.*, 2014, p.726). Although disorders such as ischaemic heart disease and rheumatic heart disease are increasing in the UK, these women are more likely to receive care in larger

OUs or tertiary referral centres (Greer, Nelson-Piercy & Walters, 2007). Consequently, midwives working in some District General Hospitals may only encounter these women infrequently.

9.3.1.2 Stability, risk of deterioration and risk status

The concept of 'risk' is complex but has been defined by James et al (2011, p11) "as the probability of an adverse outcome or a factor that increases this probability..."

Consistent with findings of the Delphi survey, where the risk of physiological deterioration was assessed to be high, midwives suggested care be escalated to a higher level (section 7.4.1.3). In keeping with evidence based guidelines, the midwives carefully examined and discussed the objective data they had received (National Institute for Health and Clinical Excellence, 2007). However, they also employed intuitive reasoning, alternatively termed 'gut instinct' (Muoni, 2012; Thompson & Dowding, 2009).

During the Delphi survey the respondents used subjective terms associated with a woman's level of clinical risk and her potential for deterioration (section 4.3.5). This finding was replicated during the focus groups as the midwives provided 'risk estimates' that summarised a woman's potential for physiological deterioration and her overall risk status, using adjectives such as 'very' and 'extremely' (high risk). Thompson and Dowding (2002, p. 59) describe these as "verbal estimates of probability" and argue these should only be used if there are no available objective measures. However, intuitive decision-making has been acknowledged as an important means by which practitioners recognise deteriorating patients (Bond & Cooper, 2006; Cioffi, 2000; Douw et al., 2015; Hams, 2000; Hodgetts et al., 2002).

A risk prediction tool, termed the Patient Acuity Rating (PAR) system, has been designed to quantify doctors' intuitive judgements regarding the risk of a patient

suffering a cardiac arrest, or requiring transfer to an ICU over a 24-hour period. This tool uses a 7 point Likert scale and acknowledges both the objective and intuitive components of clinical decision-making. A score of 1 on the PAR scale represents “extreme unlikelihood of suffering cardiac arrest or requiring ICU transfer in the next 24 hours” whilst a score of 7 represents “extreme likelihood” (Edelson *et al.*, 2011, p 476).

On pilot testing, the average PAR score was 3 ± 1 with an area under the receiver operator curve of 0.82. PAR scores of ≥ 4 had a sensitivity of 82.4% and specificity of 68.3% for detecting cardiac arrest and transfer to ICU (Edelson *et al.*, 2011), although further research is required to test the system’s validity and reliability (Edelson *et al.*, 2011; Phillips *et al.*, 2013). Furthermore, this risk predication tool was designed for use in the general patient population, and would require modification for the obstetric cohort where the incidence of cardiac arrest is rare (1:30,000 women) (Winter *et al.*, 2012). Nonetheless, the acceptance that formal risk estimates can be based on both objective data and intuitive reasoning is an innovation that requires further consideration in the care of acutely ill patients and acknowledges the intuitive aspect of care that the midwives demonstrated in the focus groups.

9.3.1.3 Pregnancy

For some midwives, a woman’s pregnancy was a significant factor when considering whether to escalate her care away from the labour ward. In discussion, midwives recalled experiences where nurses on specialist medical units were reluctant to ‘accept’ pregnant women. A descriptive qualitative study exploring the experiences of Australian critical care nurses (n=10) in caring for obstetric patients (Kynoch, Paxton & Chang, 2011), provides justification for this finding. None of the critical care nurses had completed midwifery training, and the study highlighted that they lacked the knowledge, skills and confidence to care for obstetric patients. The infrequency with which the

nurses encountered pregnant women compounded their concerns (Kynoch, Paxton & Chang, 2011). These findings may be relevant and applicable to nurses working on ICUs and general hospital wards in the UK (Kynoch, Paxton & Chang, 2011; Pollock, 2006) and were mirrored by midwives in this study, when faced with the prospect of caring for a woman with an ‘unfamiliar’ comorbidity or medical complication.

9.3.2 Mother / baby considerations and maternal support

The midwives endeavoured to keep mother and baby together, but appeared to have lower thresholds for escalating a woman’s care off the labour ward when the neonate had already been transferred to a higher level of care. The decision to separate mother and baby had been taken out of their hands, and the midwives were able to focus exclusively on the best course of action to promote maternal safety, a finding that has not been reported elsewhere in the context of care escalation.

Whilst the midwives were sensitive to the impact that transfer to ICU could have upon a woman and her family, they acknowledged that ultimately, maternal safety outweighed their desire to keep a mother and her baby together on the labour ward. They emphasised their role in providing support and information for women requiring intensive care which, is an important finding as these women often experience fear, powerlessness and deep concern about their babies from whom they are often separated from (Engström & Lindberg, 2011; Ray et al., 2012).

9.3.3 Vigilance

9.3.3.1 One to one care

One to one care is advocated for all women in established labour and a woman should only be left for short periods “at her request” (National Institute for Health and Care Excellence, 2014a). For the midwives in this study, the need for a continuous or

constant presence appeared to be a prominent consideration in their EoC decisions and reflected a defining feature of MHDC identified in the Delphi survey. However, the midwives commented on the impact this high level of supervision might have on the other women on the labour ward, replicating comparable findings in the nursing literature (Whittaker & Ball, 2000).

9.3.3.2 Observation and monitoring

Whilst some midwives from the larger OUs recognised they were not competent to provide aspects of the vigilance required for women needing MHDC others reiterated they would seek support and guidance demonstrating accountable practice (Nursing and Midwifery Council, 2015a).

The midwives highlighted that limited exposure to women requiring invasive monitoring was an issue (Hardy, 2013). This exemplifies a “low-volume, high-risk procedure” and mirrors a comparable problem recognised in an American 58 bedded rural hospital, where nurses were required to care for patients with Central Venous Access Devices (CVADs) but were only exposed to these patients on an infrequent basis (Banks, Gilmartin & Fink, 2010, p.E1). Competence is influenced by ‘skills fade’ - a decline in the ability of a practitioner to perform a specific skill over time, when it is not undertaken for long periods (General Medical Council, 2014). The length of time before the onset of skills fade will be specific to each individual and depend upon their initial level of competence with the skill, their long-term memory and the type of skill being undertaken; however, it is suggested that the process follows a relatively linear progression over time (Winfred et al., 1998).

To date, an accepted ‘frequency of exposure’ to women requiring MHDC, that enables midwives to maintain basic levels of competency have not been recommended, and is

a subject of debate in relation to patient safety (Dekker, 2011). Given that skills fade is individual specific, it may be argued that midwives themselves should be encouraged to determine when they require updating, and take the lead in identifying their own learning requirements (Burnard, 1995; General Medical Council, 2014; Nursing and Midwifery Council, 2015b).

Banks, Gilmartin & Fink (2010) conducted a pre-test post-test quasi-experimental study to examine the impact of introducing a self-study module about the care of patients with CVADs, followed by simulation sessions, for nurses who were not exposed to care of patients with CVADs regularly. Supplementary learning resources were also provided and included a journal club, posters and pictures of procedures related to CVADs, in order to “appeal to different learning styles” (Banks, Gilmartin & Fink, 2010, p.E3). Post-test questionnaires were completed at the time of the self-study module and again at three months post intervention.

There was a statistically significant difference in the pre and post-test knowledge scores of the nurses and their confidence to care for patients with CVADs improved. The authors acknowledge the study limitations included a 44% attrition rate between the first (pre-test) and third (3 month post-test) study phases and stressed the resource intense nature of introducing the intervention and the high levels of commitment required by all those involved (Banks, Gilmartin & Fink, 2010). Nonetheless, this study provides examples of the strategies that may be employed to assist midwives in developing and retaining the skills required for delivering MHDC.

In this study, midwives used informal means or ‘workarounds’ to solve the issues of skills fade / skills deficit. They enlisted the support of other professionals with the necessary expertise to help them care for these women or requested the escalation of a woman’s care to a specialist service such as ICU. Whilst these workarounds were

undertaken by individuals to optimise care of the women in the scenarios, their actions are symptomatic of wider organisational issues; in this instance a lack of education and training (Spear & Schmidhofer, 2005). It has been advocated that workarounds should not be used as long-term solutions to issues arising in clinical practice (Dekker, 2011). Resolution at a higher organizational level is required, as workarounds can eventually lead to patient safety incidents, especially where professional lines of responsibility are not clear (Cook, Render & Woods, 2000; Dekker, 2011; Spear & Schmidhofer, 2005; Wakeam *et al.*, 2014).

A limited amount of low level evidence suggests that where designated teams of midwives are specifically trained to care for acutely ill women, usually in high volume tertiary referral centres, these problems can be minimised. Midwives are specifically trained to provide MHDC, their exposure to invasive monitoring and other complex interventions is higher, their levels of skill increase, and skills retention is supported (Anonymous, 1999; Gregson, 2003; Hall, 2016; Yeadon *et al.*, 2001). This reflects the findings from other specialties (Archampong *et al.*, 2012; Drukker *et al.*, 2016).

9.3.4 Interventions

The midwives' familiarity with the treatments for severe pre eclampsia and post partum haemorrhage could explain why they were proactive in considering alternative interventions that might promote physiological stability and avert the need for escalation of care off the labour ward (DeVita, Hillman & Bellomo, 2011). Conversely, treatments for women with cardiac conditions were highlighted as being outside of their clinical competency and an indication for the EoC, reflecting the findings of Rotella *et al.* (2014) . This reinforces the emphasis professionals place on physiological instability being an indication for transfer to a higher level of care, as identified during the Delphi survey.

9.4 Professional issues that influence care escalation decisions

9.4.1 Staffing levels, skill mix and workload

A small proportion of midwives from the two larger OUs considered escalation off the labour ward if the staffing levels and / or skill mix were assessed as inadequate or the workload judged too high for the numbers of midwives on duty. This finding reflects those of an audit of UK OUs (n= 146) which reports staff had “low thresholds” for transferring women to the ICU due to staff “skill levels” (Williams *et al.*, 2015).

However, this course of action supports safe practice considering other studies have reported that inadequate skill mix and suboptimal staffing levels can negatively influence the way that deteriorating patients are managed (Endacott *et al.*, 2007; National Patient Safety Agency, 2007).

A significant number of reports emphasise the importance of OUs being staffed adequately with appropriately skilled staff (Department of Health and Partnerships for Children Families and Maternity, 2007; Healthcare Commission, 2008; Royal College of Anaesthetists *et al.*, 2007). Trusts in the NHS are responsible for reviewing staffing establishments⁴ and ensuring that robust processes are in place, so that professionals have the capacity and capability to provide high quality care on a shift by shift basis (Francis, 2013; Kirkup, 2015; National Institute for Health and Care Excellence, 2015a; National Quality Board, 2013; Sandall *et al.*, 2011). Staffing establishments must take into consideration the annual birth rate, local service configuration and the acuity and dependency levels of the local case mix (National Institute for Health and Care Excellence, 2015a).

⁴ “The number of midwife hours which were planned in advance, deemed to be required during that shift and that were actually available” (NICE, 2015)

Current NICE guidance on safe staffing in OUs does not specify the numbers or skill mix of midwives required to provide a safe service, on the basis there is “a lack of evidence establishing links between midwifery staffing levels / skill mix and [maternal and neonatal] outcomes” (National Institute for Health and Care Excellence, 2015, p.34). Midwives competent to provide MHDC were identified in this study as those who were experienced and / or in more senior clinical roles. Midwives who had previously trained as nurses were also viewed favourably with regard to MHDC provision in this study, reflecting the proposition of others (Bench, 2007; Martin & Hutchon, 2008; Vercueil & Hopkins, 2015). A recent prospective multicentre study conducted in a large teaching hospital was designed to test the inclination of midwives (n=102) to undertake obstetric ‘critical care’ training, using a Confidence and Interest in Obstetric Critical Care Nursing Scale (CIOCN). The study identified that midwives with a nursing background felt more confident to provide MHDC than direct entry midwives (Fastovets et al., 2016).

Midwifery staffing shortages and poor skill mix have been associated with the occurrence of adverse incidents or near misses (Ashcroft et al., 2003; Healthcare Commission, 2006; Kane et al., 2007). Furthermore, the labour ward workload is a variable entity, and staff have limited control over the number, acuity and dependency of women who are present at any given time (Yelland et al., 2013). Staff escalation plans outlining the actions to be taken when there is “unexpected variation in demands for maternity services and midwifery needs” are currently advocated (National Institute for Health and Care Excellence, 2015, p.12), as mentioned by some midwives in this study. However, there is currently no evidence assessing the efficacy of escalation protocols at times of high activity and their impact on maternal and neonatal outcomes.

There continues to be a dearth of robust evidence identifying the most appropriate midwife to woman ratio required for safe practice. The findings of this study suggest that midwives may use the escalation of an acutely ill woman's care away from the labour ward as a 'workaround' to counteract high labour ward activity levels and workloads, even if the midwifery capability to provide MHDC is present. This is contrary to the findings of nursing focused research that suggests high workloads can be a barrier to the escalation of care (Endacott *et al.*, 2007; National Patient Safety Agency, 2007; Smith & Aitken, 2016).

9.4.2 Multidisciplinary team working and support

Multidisciplinary team working underpins safe MHDC provision, and the importance of midwives receiving support when providing care for acutely ill women is widely acknowledged (Bench, 2007; Simpson & Barker, 2008; Van de Velde, Scholefield & Plante, 2013). As in previous studies, the labour ward coordinators were the first point of contact for midwives who regarded them as highly experienced and able to decide whether a woman could receive MHDC or EoC was required (Bench, 2007; Edwards, 2008). This reflects the findings of a social network survey conducted in an Australian Emergency Department suggesting that staff are initially more likely to seek help from members of the same professional group (Creswick, Westbrook & Braithwaite, 2009). Nevertheless, the focus group study identified that a proportion of midwifery labour ward coordinators had not received MHDC training and accessed other sources of support so that MHDC could be provided.

In the two largest OUs varying support mechanisms were enlisted to facilitate the safe care of women with invasive and ECG monitoring. Anaesthetists, with some training in intensive care medicine, have been recognised previously for their supportive role in assisting midwives to provide care for critically ill women (Bench, 2007; Mackintosh,

Berridge & Freeth, 2009; Royal College of Anaesthetists, 2016) as have the CCOT (Chellel, Higgs & Scholes, 2006; Hancock & Durham, 2007). The midwives in this study showed no reticence in contacting the CCOT, contrary to other findings (Mackintosh *et al.*, 2014).

These informal support mechanisms constitute what has been termed “in-reach” by Vercueil and Hopkins (2015, p. 204), where professionals with the necessary expertise support staff to provide MHDC, negating transfer to ICU. The introduction of the American “virtual” obstetric intensive care has been advocated by Leovic *et al.*, (2016, p1) and replicates the in-reach principle where relevant experts are mobilised and attend to the acutely ill woman.

Band 5 nurses were employed to work on the labour ward of OU I only, and were viewed positively by the Band 7 midwives who could allocate them to provide MHDC. Anecdotal evidence suggests that a combination of critical care nurses and midwives providing MHDC “has been shown to work well in some units” (MacLennan, O'Brien & Macnab, 2016, p.33). The involvement of nurses in maternity service provision is an example of ‘task shifting’. Task shifting has been advocated by the King’s Fund as a means of freeing up midwives to provide the care that they alone can provide (e.g. intrapartum care) and has been proposed as a cost effective solution to promoting safe care (Colvin *et al.*, 2013; Sandall *et al.*, 2011). However, task shifting may also lead to professional conflict (Colvin *et al.*, 2013) and have a negative impact on cohesive multidisciplinary team working.

The narratives of some Band 6 midwives suggested there were professional tensions regarding Band 5 nurses providing MHDC. The erosion of midwives’ skills to provide MHDC and the nurses’ lack of midwifery expertise were cited as areas of concern

(Colvin *et al.*, 2013). These are recognised barriers to task shifting and reflect the midwives' uncertainties about the professional roles and responsibilities of the nurses working in the OU environment, which may have negative repercussions on inter professional collaboration and patient safety (Downe, Finlayson & Fleming, 2010; Vincent, 2003). It has been identified that increasingly, nurses are employed to provide MHDC, post-natal care and work in obstetric operating theatres, and the midwives' concerns in this study would appear to reflect those of the wider profession (Dean, 2011).

A lack of confidence and trust in the decisions made by doctors who were either unfamiliar to the midwives (such as locum doctors), or classed as being in 'junior' doctor roles was apparent, as previous studies have reported (Endacott *et al.*, 2007; National Patient Safety Agency, 2007; Wakeam *et al.*, 2014). Locum doctors and, to a lesser extent, junior doctors, will move between different hospitals and healthcare teams regularly, which may lead to them being described as "outsiders" in healthcare teams, unfamiliar with local practice and who have unknown capabilities (Mackay, 1993, p.83). Trust between team members is a fundamental aspect of effective team working and will develop over time as one team member positively evaluates another team member's past or current actions, with team efficacy developing over time (Frowe, 2005; Mosser & Begun, 2014; Reynolds & Blickensderfer, 2014).

9.4.2.1 Uncertainty regarding the midwifery role

The importance of different professional groups understanding each other's roles and responsibilities has been identified as a key factor in promoting "effective collaboration" (Suter *et al.*, 2009). Professional tensions between the midwives and general nurses on wards were apparent in some of the focus group discussions. Mutual understanding of the differing roles of nurses and midwives may be initiated in pre-registration

education programmes by incorporating interprofessional learning initiatives that foster ongoing multidisciplinary collaboration (Saxell, Harris & Elarar, 2009). Multi professional guidelines specifying the midwifery and obstetric support mechanisms available to nurses who are required to care for pregnant women outside of the OU environment should be developed.

9.4.2.2 Delays receiving internal or external support

It was apparent that internal support was readily available to the majority of midwives in this study. Only a small number identified that obstetricians and anaesthetists may not be available with immediacy and this influenced their EoC decisions by lowering their transfer to ICU thresholds. For an OU with 4000-5000 births per annum, 98 hours of consultant presence is recommended, although these standards may not always be achieved (Imison *et al.*, 2014; Royal College of Anaesthetists *et al.*, 2007).

Midwives also reported that delays receiving support from physicians compromised patient safety and impeded the EoC. Mackintosh's (2014) ethnographic study has previously identified that midwives noted lengthy delays when waiting for physicians to review women. This problem has also been noted in the Confidential Enquiries into Maternal Deaths reports where direct consultant to consultant referrals have been advocated, in order to minimize or prevent maternal morbidity and mortality (Knight *et al.*, 2014).

Delays were noted to be shortened when the consultant obstetrician liaised directly with the consultant physician, reinforcing previous assertions that professional hierarchy may have an impact on the EoC process (Knight *et al.*, 2014; Mackintosh, Humphrey & Sandall, 2014; Mackintosh & Sandall, 2010). The physical distance of OU H from the onsite general hospital was also cited as a reason for delay when midwives

were awaiting external support, in line with assertions by Marstin et al. (2012), and a factor beyond the midwives' control.

9.5 The influence clinical guidelines have on a midwife's decision to request the escalation of care

Clinical guidelines are advocated as a means of promoting standardised, evidence based health care, and have been purported as a mechanism for improving the quality of care; although the integration of evidence into practice can be protracted (Blair, 2014; Fervers, Carretier & Bataillard, 2010; Mead, 2000; Natsch & van der Meer, 2003). The midwives in the smallest OU (H) worked to precise EoC guidelines stating that women requiring invasive monitoring and higher levels of care be transferred to ICU. This reflects a characteristic of a high reliability organisation where formal referral to those with the necessary expertise occurs and, there are robust systems in place to minimise the risks for patients (Leonard et al., 2012; Sutker, 2008)

The midwives in the other 2 OUs showed varying levels of reliance on, and awareness of their local clinical guidelines (National Patient Safety Agency, 2007). For example, some used staff escalation guidelines to resolve staffing shortages, whilst a small number suggested women requiring MHDC be transferred off the labour ward when staffing levels were suboptimal.

The variable adoption of guidelines may negatively influence team members' sharing of common objectives for the woman (National Patient Safety Agency, 2007) as evident in the focus group study. Some Band 6 and 7 midwives from the two larger OUs had differing opinions as to whether women with invasive monitoring should receive MHDC or their care be escalated away from the labour ward (section 7.4.4.4). These differing task mental models have the potential to cause inter-professional conflict and

constitute ambiguities in the provision of MHDC (McComb & Simpson, 2014; Spear & Schmidhofer, 2005; Wakeam *et al.*, 2014). Moreover, these opposing opinions may have contributed to the Band 6 midwives from OU I feeling 'pressured' to work beyond their sphere of competence on some occasions.

The ICS levels of care (ICS 2002, 2009) were correctly applied to the scenarios by the midwives from OU I, however, it was apparent that others did not fully understand this classification system. Moreover, a large proportion of midwives did not mention the ICS levels of care which suggests the system is not fully integrated into clinical practice, as identified in the Delphi survey. This classification system appeared to have no impact on the midwives' EoC decisions.

9.6 Synopsis

This chapter has identified the factors that influence midwives to decide either provide MHDC or request a woman's care be escalated away from the labour ward. Four main themes have been discussed and encompass service delivery, patient specific factors, professional issues and clinical guidelines.

Service delivery (research objective 1)

The midwives in the smallest OU could not provide aspects of MHDC such as invasive monitoring which reflects findings in the published literature. The proximity of the labour ward to the ICU, and the ICU bed availability influenced the midwives' EoC decisions in as much as they took into account the distances and timeframes involved for transfer to ICU and whether a bed would be available. These are described as fixed influences as they cannot be altered easily.

Patient specific factors (research objective 2)

The midwives' familiarity with a woman's diagnosis and her level of physiological stability played an important part in their EoC decisions, corroborating evidence from the literature and the Delphi survey. The prospect of providing care for a woman with an unfamiliar comorbidity influenced midwives to escalate a woman's care away from the OU. Moreover, pregnancy was identified as an impediment to EoC in some cases.

Professional issues (research objective 3)

Supporting the published literature, the midwives identified varying levels of competence to provide ECG and invasive monitoring but used 'workarounds' to facilitate MHDC provision in the two largest OUs. Workload and skill mix were influential as to whether midwives decided to provide MHDC or escalate care away from the OU. This course of action, whilst exhibiting safe practice, may have implications for ICUs. Internal and external multidisciplinary support were influential in whether the midwives felt able to provide MHDC, reflecting the findings of previous published research. The midwives identified that negative professional relationships, a lack of understanding by other professional regarding the role of the midwife and delays receiving support could be barriers to seamless care escalation.

The influence of guidelines / other factors (research objective 4)

Clinical guidelines appeared to have a variable impact on the midwives' EoC decisions. The midwives' in the smallest OU were fully aware of their transfer to ICU guideline and adhered to it. The midwives in the 2 larger OUs showed variable levels of awareness of and reliance on their local guidelines which, may in part, explain the variations in their EoC decisions, especially when deciding if they could provide care for women with invasive monitoring. The ICS levels of care do not appear to have been fully adopted into clinical practice and had no impact on the midwives' EoC decision making.

Chapter 10 Conclusions and Recommendations

10.0 Introduction

This exploratory sequential mixed methods study has examined the concept of MHDC and the factors that influence midwives' decisions whether to provide MHDC or request the EoC away from the OU. This chapter will summarise and integrate the findings of the Delphi survey and focus group studies. The strengths and weaknesses of the research methods not discussed previously will be identified and the contribution of the research to knowledge will be summarised. Finally, recommendations for clinical practice and future research will be made.

10.1 An evaluation of the Delphi survey research objectives

The Delphi survey sought to achieve the following research objectives:

1 & 2. To achieve a consensus on the defining features of MHDC and obtain a consensus definition for MHDC.

By the third Delphi round, the respondent group agreed on many features that did and did not constitute MHDC. The features were based on the conditions experienced by women and the vigilance and interventions they required, however some variations in opinion were still evident at survey completion. These variations related to extended post-operative care and postnatal epidural anaesthesia. The commonality of a condition and professionals' familiarity with it, appeared to reinforce these findings. An authentic definition for MHDC was obtained, although scope for local variation is intrinsic in the definition and may explain why consensus was achieved across the respondent group.

The respondent group equated MHDC with level 2 care in line with the literature. A proportion of professionals remain uncertain regarding the ICS levels of care

classification system. It is acknowledged that the Delphi survey was conducted approximately six years previously and if it were repeated the results could indicate that there is increased knowledge and understanding of the ICS levels of care. However, some midwives participating in the more recently undertaken focus groups were still unfamiliar with the classification parameters.

3. To examine whether the defining features of, and definition for MHDC are the same (or differ), for OUs that have differing annual birth rates.

There was relative parity across the 3 OU groups with similar annual birth rates in relation to many of the defining features of MHDC. However, professionals working in the OU group with the lowest annual birth rates were more likely to request women be transferred to ICU and equated level 1 care with MHDC. This substantiates previous findings identifying that 'local' definitions for MHDC exist and suggests some women may have low acuity levels not necessitating organ support. This early EoC away from the OU setting to ICU can be viewed as accountable and safe practice, but has workload implications for ICUs and may impact on the mother baby relationship.

4. To examine whether the defining features of, and definition for MHDC are the same (or differ) for the professional groups of doctors and midwives working in OUs with similar annual birth rates.

There was generally close agreement between doctors and midwives regarding the defining features of MHDC across the OU groups as a whole. However, compared to doctors, midwives working in the OU group with the lowest annual birth rates had lower thresholds for requesting that women be transferred to ICU (for severe obstetric conditions and certain types of non-invasive and invasive monitoring) compared with their medical colleagues. These differing task mental models have the potential to cause professional disagreements, with midwives requesting admission of women to ICU who fall into the low risk monitor category.

10.2 Evaluation of the focus group objectives

The focus group research was designed to explore the following research objectives:

1. To determine if local service delivery has an impact on a midwife's decision to provide MHDC or request care escalation.

Midwives working in the OU with the lowest annual birth rate did not have access to all of the equipment needed to provide MHDC (unlike the midwives in the two larger OUs). They were more likely to escalate a woman's care off the labour ward and did not appear to provide level 2 care, confirming a proposition arising from the Delphi survey and the published literature. The distance and location of the labour ward to the ICU and ICU bed availability had some influence on the midwives' EoC decisions. These may be described as 'fixed' influences as they cannot be changed. Some, but not all midwives from the two larger OUs were willing to provide MHDC, but their decisions were influenced by a combination of patient specific and professional factors.

2. To ascertain if patient specific factors influence midwives to provide MHDC or request care escalation

The absence of a definitive diagnosis, unfamiliarity with a condition and physiological instability increased the likelihood of midwives requesting that a woman's care be escalated away from the labour ward. These factors were also considered in relation to the monitoring and interventions that were required by a woman, and the fetal / neonatal wellbeing.

3. To examine if professional issues influence a midwife's decision to provide MHDC or request the escalation of care

Midwives from the 2 larger OUs were more likely to provide MHDC but some did not possess the necessary skills and used informal 'workarounds' to facilitate this care. Their workarounds involved seeking a variety of internal and external support mechanisms. Some midwives considered escalating the care of an acutely ill woman away from the labour ward (as opposed to providing MHDC) in response to the variable influences of skill mix and workload, a finding that has not previously been reported in relation to MHDC provision. None of the midwives from the smaller OU had the necessary skills to care for women requiring ECG / invasive monitoring.

4. To determine if clinical guidelines and / or other factors influence a midwife's decision to provide MHDC or request the escalation of care.

Varying levels of reliance on, and adherence to, local guidelines were apparent from the midwives' narratives. This may have contributed to the varying opinions of the midwives regarding whether MHDC could be provided for the women in the three scenarios. Potential barriers to EoC have been identified, with varying levels of impact upon a midwife's decision to escalate care and the ability to escalate care seamlessly.

10.3 Synthesis

A model based on the defining features of MHDC (Delphi survey) and the factors that influence a midwife to provide MHDC or request the escalation of care away from the OU (Focus Group study) is presented in Figure 10-1.

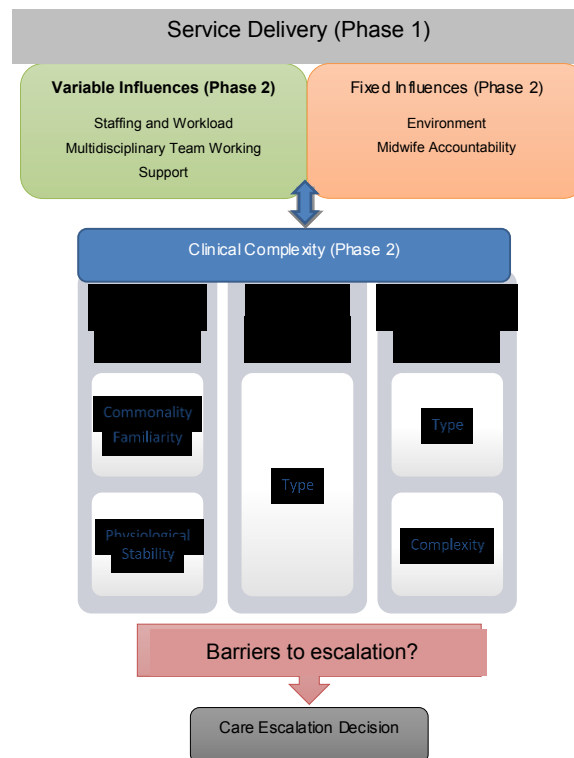


Figure 10-1 A schematic representation of Delphi survey and Focus Groups combined

Service providers are challenged with complex decisions as to whether MHDC should be provided equitably for all women, some are transferred selectively to the ICU, or all women are transferred routinely in District General Hospitals. Local service delivery is essential as it dictates whether ongoing MHDC can be provided (section 9.2.1). The patient specific factors that dictate a woman's clinical complexity and the vigilance and interventions characterising MHDC are influential in midwives' decisions as to whether

they are confident to provide MHDC safely. However, additional 'variable' factors such as the labour ward workload have been found to be significant.

Negotiations at an organisational level in NHS Trusts are paramount in agreeing the systems that are in place to either enable midwives to provide MHDC equitably for all women or, more 'flexible' options are *formally* agreed. The midwives used workarounds to contest skill deficits but these are unlikely to be fail safe in the dynamic, and complex labour ward environment (Debono et al., 2013; Sasou & Reason, 1999). There are two ways the workarounds used by midwives can be minimised or prevented and reflect recommendations made by the Royal College of Obstetricians and Gynaecologists (2013). Firstly, formal education and training programmes for midwives are introduced (Royal College of Obstetricians and Gynaecologists, 2013) and could be based on the SES competencies suggested by the Intercollegiate Maternal Critical Care Sub-Committee of the Obstetric Anaesthetist Association (2015). This may require significant fiscal commitment in terms of the initial training and education required, and ongoing strategies to negate skills fade must be included. Cost implications may be justified by the need to provide organisationally robust systems which enhance maternal safety, relieve some pressure on ICUs / general HDUs (Rajagopal *et al.*, 2011; Saravanakumar *et al.*, 2008) and proactively maintain the mother and baby relationship (Maternal Critical Care Working Group, 2011).

Secondly, the mobilisation of *formal* support mechanisms, agreed at local level, may be used to facilitate midwives to provide safe MHDC and negate the EoC away from the labour ward (Vercueil & Hopkins, 2015). These mechanisms may include involvement of the CCOT, recovery nurses and ODPs (Barrett & Yentis, 2008; Royal College of Obstetricians and Gynaecologists, 2013; Sloan & Quinn, 2013) but must be formalised

in escalation protocols and incorporated into practice in a robust manner, thereby streamlining procedures and reducing gaps in care provision.

10.4 Strengths and limitations of the research methods used

A modified Delphi approach was utilised to examine the concept of MHDC whereby statistical feedback was not provided during the third round. The rationale for this decision has been discussed in section 3.3.5.6. A major criticism of traditional Delphi surveys has been the propensity for 'specious consensus' and its ethos to 'discourage adversary processes' (Sackman, 1975, p.71). Moreover, the adoption of a reductionist approach in the development of third round questionnaire did not lend itself to the provision of statistical feedback during the third round. It is acknowledged that the removal of the statistical findings from the third round questionnaire may be identified as a study limitation by proponents of the traditional Delphi survey (Linstone & Turoff, 1975; Sackman, 1975), although the modified approach taken did not appear to adversely influence the attainment of consensus responses. By the third round the majority of statements had achieved consensus and it is accepted that consensus may never be achieved for some survey items (Linstone & Turoff, 1975).

The inclusion of qualitative comments during the second and third rounds enabled respondents to clarify their responses and this added greater depth and clarity of meaning to the descriptive statistics. The additional comments provided by the respondents during the second round also influenced the content of the third round questionnaire significantly, thereby enhancing both its content and face validity.

The proposed timeframes were over optimistic for the Delphi survey considering the time taken to ascertain participants' details from the 7 OUs, questionnaire distribution and return, reminder letters to be sent, the data analysed and the next questionnaire

developed and piloted. The time consuming nature of the Delphi survey has been recognised previously (Mullen, 2000) and this Delphi survey took fourteen months to complete. History (events that may alter respondents' opinions between rounds), is a threat to the internal validity of Delphi surveys, the longer the surveys take to complete, the greater the threat (Keeney, Hasson & McKenna, 2011). It is possible that the introduction of new clinical guidelines or changes in practice, of which the researcher was unaware, may have had an impact on the respondents' views and opinions related to MHDC provision during the study period.

The Delphi survey was conducted approximately 6 years ago, and whilst it may be argued that the findings are now dated, the issues and ambiguities regarding the terminology used to define MHDC and the variations surrounding service provision appear to persist in contemporary practice (Fastovets *et al.*, 2016; Vercueil & Hopkins, 2015; Williams *et al.*, 2015). It must also be noted that there was a significant delay of over two years between the end of completion of the Delphi survey and the commencement of the focus group discussions, due in part, to the researcher suspending her studies.

The focus group study successfully used video vignettes in conjunction with objective data to mimic real life clinical scenarios and trigger midwives' discussions related to their EoC decisions at a local level. This method was chosen when ethnographic observation was deemed ethically inappropriate and logistically problematic. However, a limitation, in terms of the scenarios used, is that none included an acutely ill woman in labour. A proportion of women will require MHDC during the intrapartum period which may dictate they need to stay on the labour ward (Scrutton and Gardner, 2012). The introduction of 'labour' into one of the scenarios may have provided further insight into this complex area of practice.

10.5 Contribution to knowledge

This is the first modified consensus method involving doctors and midwives that has been used to examine the concept of MHDC in OUs remote from a tertiary referral centre. The findings offer a comprehensive, detailed and holistic insight into MHDC that has not been reported previously. It has confirmed previous research findings and level 5 evidence with rigour and unearthed new findings. The focus group study has effectively used originally produced video vignettes to simulate real world scenarios when ethnographic research was deemed ethically inappropriate. Until now, no research has explored the factors that influence midwives' decisions to provide MHDC or escalate a woman's care away from the OU. The use of workarounds by midwives and the fixed and variable factors that further influence their decision making adds to the body of knowledge regarding the EoC and reiterates the importance of robust processes being in place to support safe MHDC provision.

10.6 Recommendations for clinical practice

Recommendations arising from this research include:

1. Education regarding the ICS levels of care for both medical and midwifery staff is needed to:
 - i) promote a shared understanding of what constitutes MHDC at the local level
 - ii) standardise the terminology used to describe this cohort of women
 - iii) enable accurate data collection.

MacLennan, O'Brien & Macnab (2016) highlight that accurate data collection is particularly important as women receiving care levels 2 and 3 form part of the Critical Care Minimum Data Set that feeds into the service commissioning process. Given that the ICS levels of care were first introduced in 2002, the term 'high dependency care' may no longer be useful.

2. The development / refinement of local EoC guidelines with clear criteria for transfer of women to higher care levels (including MHDC) may be required. These guidelines must acknowledge and incorporate contingency plans that deal with variable factors such as high labour ward workloads. Local multi professional training using simulation to trigger discussions around professionals' EoC decisions and MHDC provision (including anaesthetists and external supporters such as CCOT members) are also recommended (Johnston *et al.*, 2016).

3. Local barriers to EoC should be identified, reported and monitored through local incident reporting and governance mechanisms to detect local trends to aid the provision of seamless care.

4. The care of women with complex pregnancies / high dependency care must be introduced as 'essential skills' for pre-registration midwifery education programmes, in addition to those skills already stipulated. Although this suggestion challenges the latest guidance provided by the Midwifery 2020 report (Chief Nursing Officers of England Northern Ireland Scotland and Wales, 2010), which centres the pre-registration midwifery curriculum around 'normality', the report also acknowledges that midwives must be able to meet the needs of all women irrespective of their medical or social complexity (Chief Nursing Officers of England Northern Ireland Scotland and Wales, 2010).

10.7 Areas for future research

There are a number of potential areas for future research:

1. A replication of the focus group research using an intrapartum scenario, conducted across low and high volumes OUs to ascertain if the care escalation decisions made by midwives differ when women require intrapartum care and MHDC.
2. An exploration of professionals' perceptions and understanding of the clinical demarcations between level 1 and level 2 care. This may disentangle the 'overlap' and inform the development of additional maternity specific examples for these levels of care. Multi professional focus groups, involving obstetricians, anaesthetists, intensivists and midwives would be beneficial.
3. A multi-site prospective study examining the levels of care and severity of illness scores for women receiving MHDC, replicating that undertaken by Pollock, Harley & Nelson (2011), but conducted across OUs only, with differing annual birth rates. This would provide further insight into the acuity levels of women receiving MHDC and determine what percentage of women require monitoring only. Data collection for women transferred to the ICU (or other specialist areas) should also be collected, providing evidence into whether low volume OUs automatically escalate care off the labour ward when MHDC is required.
4. Qualitative research examining the experiences of nurses who work on acute wards and have provided care for pregnant women / those employed to work in OUs and provide care for pregnant women. This may highlight useful information for service providers and assist NHS managers to develop organizational support mechanisms designed to minimize EoC disputes as described in this study.

10.8 Conclusion

This mixed methods study provides insight into the concept of MHDC in OUs remote from tertiary referral centres and the EoC decisions made by midwives when faced with the care of an acutely ill woman. Given the increasing numbers of women that present with comorbidities and obstetric complications it is an aspect of clinical practice that requires ongoing consideration as all women deserve safe, high quality care - including those who are acutely ill.

A definition for MHDC has been produced, although this reflects local variation in service delivery. MHDC has been equated predominantly with level 2 care although some professionals equated it with level 1 care, reflecting the published literature. It is apparent the ICS levels of care are not fully integrated into clinical practice and this requires change. The use of clinical scenarios, such as those used in this research, may be helpful as educational tools to support this integration.

A comprehensive list of the defining features of MHDC have been agreed and are described by four overarching themes; conditions, vigilance, interventions and service delivery. The commonality of a woman's condition, the professional's competence to provide the necessary monitoring and treatments and a woman's level of physiological stability influence whether MHDC can be provided. Overall the relatively close agreement between doctors and midwives regarding the defining features of MHDC in this study is important given the emphasis on professional groups sharing the same mental models for care provision. However, midwives in smaller OUs were more likely to escalate care off the labour ward to ICU, confirming previous assertions that women of low acuity may be transferred to the ICU for monitoring only which, can have implications for ICU workloads and the mother baby relationship.

The contextual background of the OUs indicates that for the small number of women requiring MHDC in low volume OUs, transfer to the general HDU / ICU may be the most feasible option in terms of the fiscal commitments required for the necessary infrastructure for MHDC provision (Royal College of Obstetricians and Gynaecologists, 2013). In the larger OUs, the proximity of the labour ward to the ICU, and ICU bed availability influenced the midwives' EoC decisions, as they took into account transfer timeframes and the logistics of transfer. These are fixed influences that midwives have little or no control over.

The midwives' familiarity with a woman's diagnosis and her level of physiological stability played an important part in their EoC decisions and they demonstrated variable levels of competence to provide MHDC. Some midwives used workarounds to enable them to provide MHDC, utilising informal support mechanisms both internal and external to the OU setting, but these are unlikely to be fail safe. Variable factors including midwifery staffing levels, the labour ward workload and the availability of support also influenced the midwives' decisions as to whether they could safely provide MHDC or needed to escalate care away from the OU. In OUs where MHDC is provided, this could lead to inequitable care provision for acutely ill women and at an organisational level, robust systems are required to ensure that gaps in MHDC care provision are identified and ameliorated.

The midwives from the two largest OUs showed variable levels of awareness of and reliance on clinical guidelines, which may in part, explain the variations in their EoC decisions. Barriers to the EoC were sometimes encountered by the midwives, the most notable being pregnancy, with professionals outside of the OU setting being reluctant to provide care for this cohort.

This research indicates there may be inequitable MHDC provision in OUs that are remote from tertiary referral centres, reflecting the current literature. Organisationally robust systems including education and training for midwives and precise EoC protocols, that take into consideration the local service delivery and variable influences that affect midwives' EoC decision making are required to reduce gaps in MHDC provision.

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Appendix One

Table A1-1 Research papers included in the MHDC literature review

Author	Focus of research	Brief overview of study design	Research critique / level of evidence
Bench (2007)	Midwives' recognition and management of women with critical illness.	Multi-method design. Simulation (written) exercise using a two-part questionnaire with eleven midwives and interviews with five midwives. Conducted in one large London hospital.	Philosophical approach of researcher not stated but it would appear a pragmatic approach was taken. Data collection tools were piloted. Analyses undertaken appear rigorous from the descriptions provided. The researcher mentions the use of a quantitative component of the study but this is not reported in the results section and the researcher states that inferential statistics were not undertaken due to the small sample size. This is a study limitation. <i>Level 3 evidence according to the JBI levels of meaningfulness</i> (JBI, 2016).
Cordingley & Rubin (1997)	Assessment of facilities / equipment / service provision across all UK OUs for post operative recovery, MHDC and intensive care.	Postal Survey Questionnaires sent to consultant anaesthetists responsible for Obstetric anaesthesia working in 262 UK OUs. Questions aimed at assessing service provision for post operative recovery, high dependency, intensive care including equipment and facilities.	Study very dated – conducted in 1994. Changes in clinical practice since the study conducted will influence the external validity of the findings. Questionnaire not piloted but non-responders followed up. High response rate 89% (n=232) increases generalizability at time the study. <i>Level 4b evidence – cross sectional study</i> (JBI, 2016)
Cockerill et al. (2013)	To examine the education and training of midwives providing MHDC	Questionnaire sent to midwives of a tertiary referral centre in the UK enquiring about their experience in terms of preparation for the provision of MHDC.	It is not specified how the questionnaire was developed or the form it took. The sample is a purposive sample and midwives working in tertiary referral centres may not be representative of midwives working in smaller OUs. There was a high response rate of 86% (n=60). Rigour of study difficult to assess as this was a conference abstract. <i>Level 4 evidence</i> (JBI, 2016)
Dattaray et al. (2013)	Ascertain the requirement for MHDC, indications for admission and treatments received	Retrospective cohort study (4-year period) in biggest tertiary referral centre in East India with 14 general HDU beds. Maternal demographics / HDU data recorded from case notes.	<i>Level 4c evidence (case series)</i> Limited details as to how the data were obtained, but in depth description re data analyses provided. No discussion regarding quality of data. Eastern Indian data - cannot be generalized to UK population as service provision and case mix not comparable. 48/57 women had no antenatal care and were from a very high risk local population.
Du Plessis et al. (2010)	Abstract. Country wide survey linked to Scottish Confidential Audit of Severe Maternal Morbidity.	Scottish wide survey of consultant OUs in 2007 examining high dependency care provision	<i>Level 4 evidence (observational – descriptive)</i> 14/18 OUs responded. N.B. unable to undertake full critical appraisal of quality of evidence as this was an abstract.

Table A1-1 Summary of research included in the MHDC review.

Author	Focus of research	Brief overview of study design	Research critique
Fraser et al. (2010)	"Evaluation of how Midwife Teachers contribute to the outcomes for women and their families"	Three phase study involving 1. UK survey of models of pre-registration midwifery education. 2. Case studies to assess how midwife teachers influence students' experiences and 3. Analyses of newly qualified midwives' diaries to assess competence and confidence.	Study conducted on multiple study sites involving a large number of participants. Triangulation of data sources increases trustworthiness of findings. Information regarding MHDC and newly qualified midwives was a secondary finding. High quality study <i>classified as level 2 (mixed methods synthesis) evidence on the JBI levels of meaningfulness scale.</i>
Garfield et al (2000)	Calculation of TISS and Nurse Dependency scores for patients admitted to a general HDU to determine staffing levels	Over a 7-month period TISS 28, nurse dependency scores and APACHE II scores calculated for all patients admitted to a general HDU (n=407). Prospective study.	Data collection processes poorly described making it difficult to comment on validity and reliability. Data analyses described in detail. Descriptive and inferential statistics utilized. <i>Level 4 evidence.</i>
Gaunt et al. (2002)	Indications for MHDC Interventions / monitoring received	Data collected using the National Obstetric Anaesthesia Database. Prospective study Women classified using Department of Health (1996) high dependency care guidelines 4248 women identified but 3947 included in the analyses	Difficult to critically appraise rigour as abstract only Prospective study but time span for data collection is not specified. <i>Level 4c evidence on basis of information provided</i>
Hussain et al. (2011)	Survey of facilities and care provision	Questionnaire sent to 228 OUs in the UK (2005-2006). 75% response rate (n=170).	Very limited description regarding the data collection tools or processes used. No description of how the questionnaire was devised. Poor description of research methods makes critical appraisal of the quality of the study difficult. <i>Level 4 evidence on the basis of the information provided.</i>
Kavanagh & Browne (2015)	Examination of demographics, admission diagnoses to MHDC and transfers from MHDC to ICU	Retrospective observational study. Conducted over a three-year period (2011-2014) in a large tertiary referral centre in Ireland.	Abstract for poster presentation – provides useful local data but the rigour of the data collection methods cannot be commented upon. <i>Level 4 evidence according to type of study.</i>
Kearns et al. (2010)	Education and training of midwives who provide MHDC on the Labour ward.	Survey recruiting 36 midwives out of a total of 67 (54%) in one OU. Midwives were asked to comment on a series of statements and rate them against a five point Likert scale.	Abstract for poster presentation therefore it is not possible to assess how the statements were formulated or whether they were piloted. <i>Level 4 evidence according to the type of study</i>

Table A1-1 Summary of research included in the MHDC review (continued)

Author	Focus of research	Brief overview of study design	Research critique
Pollock et al. (2011)	To examine and compare the severity of illness scores across women admitted to the ICU, general HDU or MHDC	Prospective cross sectional study conducted across seven tertiary level hospitals in Australia between 2002 -2004. APACHE II and TISS 28 scores compared across all three cohorts of women.	Data collection and analyses reported in detail – rigorous approach is evident and the researchers report a number of strengths including; accuracy of data collected, calculation of severity of illness scores by one researcher and high percentages of women agreeing to participate in the study (from the ICU and general HDU cohorts) Limitations acknowledged by the researchers include the inability to quantify the DS population, missing physiological variables for the severity of illness scores and the small sample sizes. <i>Level 3e evidence</i>
Rangarajan et al (2014)	To gain views of midwives regarding their confidence and competence to provide MHDC	Survey of midwives across two large UK hospitals (a District General and a Teaching Hospital, birth rates > 5500 per annum). Midwives asked to comment on their abilities to provide MHDC.	Abstract, so unable to comment on the rigour of processes used. There is no mention as to whether data collection tool was piloted or how it was analysed. The OUs had maternal critical care units so may not be typical of smaller OUs. <i>Level 4 evidence</i>
Rajagopal et al (2011)	To examine MHDC utilization rates	Retrospective survey of MHDC admissions over 8 months (in 2010)	Abstract only. Only 50 out of a total of 74 case notes were available for review making the validity of the findings questionable <i>Level 4 evidence</i>
Rawal et al. (2008)	To assess MHDC provision in the UK.	Survey of 235 maternity units in the United Kingdom (over four month period in 2007).	Abstract so unable to comment on rigour of processes used. 67.6% response rate. <i>Level 4 evidence on the basis of the information provided (Level 4, Observational – descriptive)</i>
Redshaw et al (2011)	Birthplace national prospective cohort study to determine how maternity care is organized in England	Mandatory survey of all 152 NHS Trusts providing maternity care in UK (Healthcare Commission and National Perinatal Epidemiology Unit) in 2007. Follow up survey in 2010 (optional participation) using a subset of original questions.	Rigorous national survey. 100% response rate due to mandatory nature in 2007. 2010 survey had a 63% response rate. Research methods described in detail. Measures were taken to follow up non-responders <i>(Level 4, Observational – descriptive)</i>
Ryan et al. (2000)	To assess local MHDC admission rates and transfer rates to ICU	Retrospective case note review conducted in one large OU in Dublin over two year period (1996-1998).	Data sources are clearly described. Methods for data collection do not provide informing on who collected the data, or tools used. Data analyses processes are clearly described and appropriate. Retrospective nature of the data may influence the quality of the data collected. <i>Level 4 evidence (Observational-Descriptive)</i>
Saunders et al. (2013)	To assess if obstetric critical care is fit for purpose in 2012	Self-report National survey. Follow up survey to the one conducted in 2007. 227 OUs approached.	Validated survey was used, but there is no reference as to the validation process used. Assessment of study rigour not possible as this was an abstract. 60% response rate (n= 137)

Table A1-1 Summary of research included in the MHDC review (continued)

Whitworth et al. (2016)	To assess local MHDC admission rates and indications for admission	Tertiary referral centre with 4 HDU beds. Review of electronic data for admissions and clinical details of women requiring MHDC (retrospective).	Abstract so unable to comment on rigour of processes used. <i>Level 4 evidence</i> – quality not assessed
Williams et al. (2015)	To assess UK provision of MHDC against the recommendations made by the Maternal Critical Care working group (2011)	National cross sectional electronic survey (200 OUs invited to participate). Conducted in conjunction with the Obstetric Anaesthetists Association	Abstract, so unable to comment on rigour of processes used 146 OUs (73% response rate). Mixture of tertiary referral and district general hospitals. No information regarding data collection tools / analyses. <i>Level 4 evidence (Observational -descriptive)</i>
Zeeman (2003)	To describe the admission diagnoses and transfer rate of women admitted to an intermediate care unit	Prospective study (over 2 years) evaluating admissions to a five bedded obstetric intermediate care unit over a two year period (1998 and 1999) and obstetric admissions to the medical / surgical intensive care unit. Study conducted in Dallas USA in a maternity unit conducting 14,000 births per year	American maternity unit, sample may not generalizable to the UK population as the characteristics of the local case mix are not known. Findings are dated now. <i>Level 4 evidence (Observational-descriptive)</i>

Table A1-1 Summary of research included in the MHDC review (continued)

Table A1-2 Audits included in the MHDC review

Author(s)	Focus	Processes used	Information obtained
Crozier & Wallace (2011)	Single site 2-year retrospective audit Australia	Review of care and outcomes in an obstetric ICU. Data collected from ICU database plus review of notes. Analyses included severity of illness scores. Data collected over a 24-month span. Authors acknowledge there is the possibility that some data may have been missed.	Focus on ICU but with relevance in terms of severity of illness scores of women admitted and the suggestion that HDU care is feasible for some women admitted to the ICU.
Intensive Care National Audit and Research Centre (2011)	National audit (ongoing)	Data collected using the UK Case Mix Programme Robust data collection and data cleansing methods.	Percentage of women requiring levels 1,2 & 3 care admitted to ICUs. Admission criteria for all women classed as having an obstetric admission to intensive care, severity of illness scores and length of stay.
Intensive Care National Audit and Research Centre (2013)	National audit (ongoing)	Detailed descriptive analyses of admissions to ICU (women aged 16-50 currently or recently pregnant) using the Case Mix Programme data.	Admission diagnoses to ICU and outcome data. Severity of illness scores summarized.
James & Barclay (2015)	Audit of MHDC arterial line use / failures	All MHDC patients with arterial lines identified over 4 week period. Proforma used to map adherence to clinical guideline. Author from large tertiary referral centre in the UK.	Arterial line use / adherence to guidelines
Knight et al (2014) & Knight et al (2015)	Maternal Deaths in the UK	An ongoing National audit of maternal deaths. Maternal deaths are notified by e.g. OUs, public, coroners, Local Supervising Authority Midwifery Officers and deaths are cross referenced with the ONS / National Records of Scotland. Audit has been running for approximately 60 years. Currently run by MBRACE-UK / National Perinatal Epidemiology Unit (NPEU)	Data pertaining to maternal mortality and more recently morbidity in the UK. Substandard care is highlighted and learning points for professionals / organizations identified. Trends are identified.
Kuukasjarvi & Waite (2012)	One-week evaluation of ICS levels of care	Retrospective audit of case notes in a Lancashire teaching hospital over a one-week period in September 2010 to categorize the level of care received. It does not state who was responsible for mapping the level of care to each case.	Levels of care as applied to all women admitted to the labour ward.
Murugandoss et al. (2014)	3-month evaluation of levels of care	Retrospective audit in tertiary referral centre mapping MHDC against levels of care. It does not state who was responsible for mapping the level of care to each case.	Four levels of care identified and mapped to HDU admissions. Adherence to HDU guidelines also evaluated.

Table A1-2 Summary of audits included in the MHDC review

Author(s)	Focus	Processes used	Information obtained
Quinn et al. (2000)	MHDC provision in one region and the education and training provided for midwives	1. Questionnaires sent to midwives in charge of 18 labour wards in Yorkshire region. 86% response rate. 2. Questionnaires also sent to midwives commencing an HDU course to assess their level of confidence providing aspects of MHDC (number of midwives not disclosed)	Service provision – deemed inadequate in terms of dedicated HDU facilities. Education and training of midwives identified as needing improvement.
Raglan (2015)	Prospective audit (4 months) to assess indication for MHDC	Source of data (clinical notes / electronic) not specified. As published abstract, audit processes are not specified. Data collected for 43 women.	Clinical indications for MHDC were described.
Saravanakumar et. al (2008)	Retrospective and prospective audit	Four years of data collected prospectively from July 2003- June 2007 in one English tertiary referral centre. Retrospective audit from 1987 – 2007 also conducted.	Indications for MHDC cited for a 23 year period and also 4 years of prospective data presented. These provide detailed indications for admission to MHDC and the percentage of women requiring transfer to ICU.

Table A1-2 Summary of audits included in the MHDC review (continued)

Table A1-3 The review articles / opinion papers / clinical guidelines included in the MHDC focused review

Review articles / Opinion papers / Clinical	
Association of Anaesthetists of Great Britain & Ireland and the Obstetric Anaesthetists' Association (2013)	Plaat & Wray (2008)
Billington and Stevenson (2007)	Price et al (2008)
Carlin & Alfrevic (2008)	Royal College of Anaesthetists et al. (2007)
Goebel (2004)	Scrutton & Gardner (2012)
Guisse & Segel (2008)	Simpson & Barker (2008)
Hardy (2013)	Sultan et al. (2013)
Intensive Care Society (2002, 2009)	Van de Velde et al. (2013) (Edited Book)
Intercollegiate Maternal Critical Care Sub-committee of the Obstetric Anaesthetists Association (2015).	Vaughan et al. (2010) (Book)
James et al. (2011)	Vercueil & Hopkins (2015)
Martin & Hutchon (2008)	Wheatly (2010)
Maternal Critical Care Working Group (2011)	Winter et al. (2012)
Patil et al. (2015)	Yeadon et al. (2001)

Table A1-3 Level 5 evidence included in the MHDC review

Table A1-4 Research papers included in the EoC literature review

Author	Focus of research	Brief overview of study design	Critical Appraisal
Bick et al (2014)	The use of Early Warning Scoring Systems by midwives and the factors that influence this use.	Questionnaire sent electronically to all UK Heads of midwifery. Questionnaire (adapted), based on one previously used for a professional survey. Respondents were also asked to send back a copy of the EWS they used if different to the one recommended by CEMACH (2007)	Study shows congruence between the aims and findings. Data collection tool pre-tested. Follow up processes for non-responders apparent. <i>Level 4 evidence according to JBI classification for effectiveness.</i>
Callaghan et al. (2016)	Factors influencing junior doctors to recognised and manage patient deterioration	Authors describe this as an integrative review, it follows the lines of systematic review in terms of the processes that are described to the reader.	<i>JBI level 1 evidence for meaningfulness (systematic review of mixed methods / qualitative findings)</i>
Chua et al. (2013)	To explore experience of Enrolled Nurses with deteriorating patients	Conducted in Singapore. Exploratory descriptive study involving 15 nurses on a general ward. Data collection - individual semi structured interviews were audiotaped. Analyses using qualitative content analysis.	Measures to ensure trustworthiness included; data saturation, investigator triangulation. <i>Level 3 evidence on the meaningfulness scale.</i>
Endacott et al. (2007)	Recognising and communicating patient deterioration in an Australian regional hospital	Multi methods study using a case study approach examining the records of 17 patients that were unexpected admissions to the ICU. Interviews with doctors and nurses involved in the cases were also undertaken.	The study shows congruence between the research methods and the study aims, illustrations from the data reinforce the study findings and <i>comprises level two evidence in relation to 'meaningfulness' (JBI, 2016)</i>
Gill et al. (2016)	The impact family initiated escalation of care has for the deteriorating patient	A systematic review spanning 2005-2015.	Clear question cited. Search strategy clearly defined and appropriate. Critical appraisal of data by two researchers. <i>JBI level 1 evidence for meaningfulness (systematic review of mixed methods / qualitative findings)</i>
Johnston et al. (2014)	Qualitative study examining failure to rescue in surgical patients	Multicentre study involving 41 participants (doctors, nurses, critical care outreach team staff) from three London hospitals. Semi structured interviews lasting 30-50 minutes.	Development of data collection tool clearly described and piloted. Data analyses based on "grounded theory" although no mention of theoretical sampling associated with grounded theory. Data saturation was achieved. Rigorous data analyses methods employed and member checking undertaken. <i>High quality study, level 3 evidence on the JBI meaningfulness scale</i>

Table A1-4 Research included in the escalation of care review

Author	Focus of research	Brief overview of study design	Research critique
Johnston et al. (2015)	Systematic review of factors affecting failure to rescue and escalation of care in surgery	Systematic review of 42 studies (qualitative synthesis)	<i>Level 1 evidence.</i> Diverse specialties included in this review. It is notable that the researchers identify they included low quality evidence in this review which is contentious. They argue that helpful information would have been lost had these lower level studies not been included.
Johnston et al. (2016)	Testing whether an educational session on adopting a structured approach to care escalation improves junior surgeons' core EoC skills.	Double Blinded Randomised Controlled Trial. Educational intervention promoting a systematic approach to EoC provided for the intervention group. Control group received a memory exercise.	<i>Level 1c RCT (for effectiveness).</i> High quality RCT using intervention based on research (although not described in detail in the paper). Outcomes were measures using previously validated tools.
Mackintosh, Humphrey & Sandall (2014)	Value of (MEOWS) for managing maternal complications in the peripartum period	Ethnographic study conducted in two large city OUs. 120 hours of fieldwork, documentary evidence review, 45 semi-structured interviews with the multi professional team providing maternity care.	The research methods employed are comprehensively described in supplementary appendix. The study comprises high quality evidence. <i>Level 2 evidence on meaningfulness scale</i>
National Patient Safety Agency (2007)	Factors predisposing deterioration incidents	Mixed methods study using multiple data collection sources (focus groups with doctors and nurses, an ethnographic observational study conducted on four acute hospital wards and aggregate root cause analysis of deterioration incidents). Conducted across more than one UK hospital site involving.	Triangulation of findings across different hospitals is identified as a study strength by the researchers who also suggest a study limitation is the "small numbers of staff and sites". High quality evidence when critically appraised using the JBI critical appraisal tools. <i>Level 2 evidence (meaningfulness)</i>
Rotella et al. (2014)	Factors that influence Junior Medical Officers (JMOs) to escalate care.	Self-report survey to JMOs (n= 50) comprising statements rated against a five point Likert scale. Opportunity for additional comments provided.	Questionnaire was piloted and a focus group conducted to examine face / content validity of questionnaire. Data analyses described in limited detail. Ethical issues – questionnaire presented to JMOs by senior doctors – this may have influenced the 100% response rate. <i>Level 2 evidence (meaningfulness)</i>
Smith & Aitken (2016)	Exploration of barriers / facilitators to EoC.	Mixed methods study, second phase of this study of interest to EoC review. Questionnaires derived from first phase chart audit findings. Mixture of 'knowledge based' questions and open ended questions.	Data collections tools – rigorous (measures taken to promote face and content validity) Data analyses – combination of content analysis and 35% response rate (n=20), may have impact on generalizability of the findings (<i>level 2 meaningfulness</i>)
Wakeam et al. (2014)	An examination of characteristics of 'outlier' hospitals with regards failure to rescue rates.	Semi structured interviews with staff (key decision makers for surgical care provision) working across seven hospitals purposively sampled for high / low FTR rates and differing service provision.	Sample selection clearly described and justified. Data collection processes and analyses undertaken rigorously. Strengths and limitations of methods used discussed comprehensively. <i>Level 3 evidence on meaningfulness scale.</i>

Table A1-4 Research included in the escalation of care review (continued)

Appendix 2

Examples of pre-existing conditions / complications that may be encountered by maternity service providers

Examples of some obstetric conditions and complications that may be encountered by maternity service providers.

Comorbidity / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Clinical management / treatment summary
Cardiovascular disorders	<p>1. A spectrum of disorders including congenital and acquired heart disease (Robson and Waugh, 2013)</p> <p>2. Dependent on condition.</p> <p>"Mild structural disease affects 1% of live births 0.8% pregnant women have congenital heart disease" (Robson and Waugh, 2013, p.44)</p> <p>e.g. atrial septal defect, ventricular septal defect, tetralogy of fallout</p> <p>Moderate structural disease e.g. transposition of great arteries, sortation of the aorta 5-8% of congenital heart disease.</p> <p>Severe structural disease e.g. Marfan's syndrome, cyanotic disease (unoperated) – incidence depends on type</p> <p>Acquired – rheumatic and valvular disease (incidence related to country of origin)</p> <p>Marfan's syndrome 5 per 100,000 incidence</p> <p>Cardiomyopathy – 1:5000</p> <p>Arrhythmias 2-4% of population (Robson and Waugh, 2013)</p>	<p>1. Haemodynamic changes associated with pregnancy may have a deleterious effect on cardiac pathology (Cohen and August, 2013). Cardiac disorders may cause physiologically instability in the parturient, whilst the normal physiological changes associated with pregnancy may exacerbate the signs and symptoms of some pre-existing cardiac conditions (Greer, Nelson-Piercy & Walters, 2007)</p> <p>2. Cardiac conditions have been and remain the "largest single leading cause of indirect maternal deaths" (Knight <i>et al.</i>, 2014, p.17) and are a commonly encountered comorbidity.</p>	<p>Dependent on diagnosis, assessed risk and physiological impact. Pre-conception care is paramount. Some cardiac medications are teratogenic.</p> <p>Will require multidisciplinary team input / may require referral to a tertiary referral centre.</p> <p>Where complex invasive monitoring is required level three care on an ICU / CCU may be indicated (Royal College of Obstetricians and Gynaecologists, 2011a)</p>
Diabetes (pre-gestational)	<p>1. There are two classifications. Type 1 and Type 2 diabetes means women have a "life sustaining requirement for insulin" (Greer <i>et al.</i> 2007, p83).</p> <p>2. Incidence of type – accounts for 20% of diabetes whereas the type 2 accounts for 80% (Robson & augh, 2013)</p> <p>Type 2 diabetes is more likely to present in later life</p>	<p>1. Type 1 arises because of destruction of the pancreatic Beta cells. This may be due to a genetic predisposition. Type 2 occurs due to insulin resistance and altered insulin production.</p> <p>Maternal morbidity results from microvascular and macrovascular complications. Where glycaemic control is poor, hypo or hyperglycemia may result.</p> <p>Fetal morbidity / mortality is raised where glycaemic control is poor and may lead to IUGR, fetal abnormalities, macrosomia (and increased risk of shoulder dystocia, intrauterine death. (Robson & Waugh, 2013)</p>	<p>Management is aimed at achieving optimum glycaemic control. Pre conception care is advocated to reduce the potential for adverse maternal and fetal outcomes,</p> <p>Antenatal management includes:</p> <ol style="list-style-type: none"> 1. Tight glycaemic control. Aim for fasting capillary blood sugar of 5.3mmol/Litre. One hour post prandial value of 7.8mmol/Litre. Monitoring of HbA1c (Glycosylated haemoglobin) may be monitored to assess longer term control of blood sugars. 2. Retinal assessment to detect for retinopathy. 3. Monitor fetal growth / wellbeing by ultrasound scan / Dopplers where concerns 4. Assessment of renal function is required. Referral to a nephrologist may be indicated. <p>Close monitoring during labour and postnatal follow up are indicated. Sliding scale insulin during labour.</p> <p>Type two diabetes can be managed with diet and oral hypoglycemic medications or in some cases insulin may be required. During pregnancy metformin may be continued but other oral hypoglycaemics are contraindicated in pregnancy and insulin will be prescribed.(National Institute for Health and Care Excellence, 2015b)</p>

Table A2-1 Examples of pre-existing conditions / complications that may be encountered by maternity service providers

Comorbidity / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Clinical management / treatment summary
Sepsis (bacterial)	<p>1. Sepsis is defined as “life-threatening organ dysfunction caused by a dysregulated host response to infection” (Singer <i>et al.</i>, 2016, p.1). Risk factors for sepsis in pregnant / postnatal women include diabetes, obesity, history of Group B streptococcus, anaemia, vaginal discharge, cervical suture in situ, those immunosuppressed (Royal College of Obstetricians and Gynaecologists, 2012).</p> <p>Severe sepsis was defined as infection associated with organ dysfunction and / or hypotension and hypo perfusion that may rapidly progress to septic shock when left untreated (Acosta <i>et al.</i>, 2012; Sung, George & Porter, 2011). The term is no longer used</p> <p>2. Incidence of severe sepsis was 4.7 (95% CI 4.2–5.2) per 10,000 maternities in the UK (Acosta <i>et al.</i>, 2014).</p>	<p>1. Systemic inflammatory response syndrome (SIRS) is characterized by ≥ 2 of the following: pyrexia, tachycardia, tachypnoea, abnormal white cell count, hypothermia. There may be an altered mental state. This may progress to septic shock (Comstedt, Storgaard & Lassen, 2009). Serum lactate will be raised.</p> <p>2. Maternal death rate in 2011-13 was 1.56 per 100,000 maternities (95% CI 1.10 to 2.15) (Knight <i>et al.</i>, 2015, p.12). Morbidity resulting from sepsis may include ongoing organ dysfunction and amputation of a limb.</p>	<p>Sepsis six refers to the three investigations and three interventions that should be instigated when sepsis is suspected.</p> <ul style="list-style-type: none"> Bloods for full blood count, CRP, renal and liver function, plasma glucose, clotting screen and lactate (venous sample or arterial blood gas), blood cultures. Administer facial oxygen and monitor oxygen saturations Intravenous antibiotics (broad spectrum). Monitor the urine output (fluid balance chart) Intravenous fluids where hypovolaemia, raised lactate <p>Senior clinician input will be required. Monitor using EWSs. Wound swabs, sputum specimens, if postnatal review perineal trauma, lochia, obtain low vaginal swab.</p> <p>Some patients will require single or multiorgan support in the ICU.</p>
Venous thromboembolism	<p>1. The signs and symptoms of VTE vary in severity and physiological impact depending on the size and site of the thrombus, (James <i>et al.</i>, 2011).</p> <p>2. Pulmonary embolism (PE) describes the “occlusion of the pulmonary arterial circulation” due to a thrombus traversing from a distant site such as the deep leg veins. Signs and symptoms may include pleuritic chest pain, haemoptysis, dyspnoea, hypoxia and circulatory collapse (Robson & Waugh, 2013, p.287).</p> <p>Pregnancy is associated with a ten-fold increase compared with the risk for non-pregnant women of the same age (RCOG, 2010)</p>	<p>Pregnancy is described as a hypercoagulable state due to the increase in coagulation factors (e.g. II, VII, VIII, X) and inhibited fibrinolysis that occurs to diminish blood loss at birth (Prisco, Ciuti & Falciani, 2005). The risk of thrombotic events in pregnancy increases fivefold compared with the non-pregnant population (Cohen & August, 2013). Venous thromboembolism (VTE) is a leading cause of maternal death (Knight <i>et al.</i>, 2015; Lewis, 2007). The incidence of antenatal PE is 1.3 per 10,000 maternities (95% CI 1.1–1.5) (Knight & UKOSS, 2008).</p>	<p>Suspected deep vein thrombosis - objective testing is undertaken and low molecular weight heparin (LMWH) administered until the diagnosis is excluded. Objective testing includes compression duplex scanning:</p> <p>If PE suspected a chest x-ray will be performed. Compression duplex Doppler should be performed where this is normal. Where both tests negative but clinical suspicion for PE remain “a ventilation perfusion (V/Q) scan or CTPA (computed tomography pulmonary angiogram) should be undertaken” (RCOG, 2010, p2). D-dimers are not diagnostic in pregnancy due to the hypercoagulable state of pregnancy. PE can be life threatening and require emergency treatment – oxygen, arterial blood gases, IV heparin, level 3 care. Low molecular heparin is relatively safe in pregnancy. Warfarin is contraindicated as it can cross the placenta and is teratogenic. Intrapartum care must take into consideration the increased tendency for haemorrhage. Postnatal continuation of anticoagulants is vital. May require testing for thrombophilias (Royal College of Obstetricians and Gynaecologists, 2015a)</p>

Table A2- 1 (continued)

Obstetric specific condition / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Clinical management / treatment summary
Acute fatty liver of pregnancy (AFLP)	<p>1. Micro vesicular fatty infiltration of the liver during the latter half of pregnancy. $\geq 50\%$ women will have mild hypertension and proteinuria and the distinction from HELLP syndrome is difficult. Diagnosed during pregnancy or in the postnatal period (Lyll & Belfort, 2007)</p> <p>2. Rare affecting 1: deliveries, UKOSS states incidence of 5 in 100,000</p>	<p>1. Aetiology not precisely known. Possible variant of pre eclampsia. Possible links with the autosomal recessive fetal / neonatal enzyme deficiency, long chain acyl-CoA dehydrogenase (LCHAD) (British Liver Trust, 2012)</p> <p>2. Increased maternal mortality (2%) and fetal mortality (James <i>et al.</i>, 2011)</p>	<p>Management in intensive care may be required but will depend on the severity of the signs and symptoms (Vomiting, abdominal pain, jaundice, hepatic encephalopathy, polydipsia, pruritus, ascites, liver failure leads to <u>severe</u> coagulopathy)</p> <p>AFLP is a medical and obstetric emergency due to the metabolic alterations and complications that occur and because of the need to interrupt pregnancy. Delivery of fetus - to improve maternal situation, is indicated.</p>
Amniotic Fluid Embolism (AFE)	<p>1. Amniotic fluids embolism is a potentially life threatening condition where amniotic fluid enters the maternal circulation causing collapse and cardiac arrest in some cases. This may be due to a pressure gradient although other theories exist (Conde-Agudelo & Romero, 2009)</p> <p>2. Reported incidence of AFE varies. 1 in 50,000 women has been reported (Foley, Strong & Garite, 2014)</p>	<p>1. The pathophysiology of AFE is poorly understood and a number of hypotheses have been put forward. One possible theory is the components of AFE (that include fetal epithelial cells, lanugo hair, vernix) evoke an anaphylactoid type response. For a full discussion see Conde-Agudelo & Romero (2009).</p> <p>2. Mortality rate of 0.57/100,000 maternities has been reported (Centre for Maternal and Child Enquiries, 2011). Fatality rates for those suffering AFE are high. The condition used to be diagnosed retrospectively on post mortem. Advances in immediate obstetric care and ICU care mean more women now survive in developed countries</p>	<p>Management will be supportive - respiratory and cardiovascular support will be required where there has been sudden maternal collapse. The treatment of coagulopathy will be required as major obstetric haemorrhage can ensue rapidly.</p> <p>Given the high fatality rates and complex nature of the condition level 3 critical care is often required to provide multi organ support (Belfort <i>et al.</i>, 2010; Intensive Care National Audit & Research Centre, 2013).</p>

Table A2-2 Examples of the obstetric conditions and complications that may be encountered by maternity service providers

Obstetric specific condition / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Brief overview of clinical management / treatment summary
Antepartum haemorrhage (APH)	<p>1. Bleeding from the genital tract after 24 completed weeks of pregnancy. Two main causes are placental abruption and placenta praevia.</p> <p>2. Abruption complicates 1% of all pregnancies Placenta praevia has incidence of 0.5 – 1.0 %</p>	<p>1. Abruption: Premature separation of normally situated placenta Bleeding may be revealed, concealed or mixed, Three grades – Mild, Moderate and Severe 1. Praevia. Placenta is partially or totally implanted in the lower uterine segment Incidence 2. A cause of severe maternal morbidity and mortality.</p>	<p>Management will centre on identifying the cause of the bleeding. Basic management principles: Maternal Observations – Stabilise mother (ABC approach) Wide Bore Venous Access (Full Blood Count, Group and Cross Match – 6 units? coagulation screen). IV fluids / Blood products Confirm fetal wellbeing – CTG / Ultrasound Scan Steroids where delivery is not imminent, and the pregnancy is preterm to promote fetal lung maturation. Low lying placenta – NO vaginal examinations. May require emergency LSCS depending on fetal and maternal condition. Major haemorrhage may lead to coagulopathy and level 2 or 3 care will be required.</p>
Hypertensive disorders (pre eclampsia, eclampsia, HELLP syndrome)	<p>1. Pre-eclampsia is defined as 'new hypertension presenting after 20 weeks gestation with significant proteinuria' whilst severe pre-eclampsia is defined as the presence of severe hypertension and/or with symptoms, and/or biochemical and / or haematological impairment (National Institute for Health and Care Excellence, 2010). HELLP syndrome is a severe variant of pre-eclampsia characterised by haemolysis, elevated liver enzymes and low platelets, whilst eclampsia describes a convulsive state that is a serious complication of pre-eclampsia (Lyll & Belfort, 2007). The presence of comorbidities such as renal disease, autoimmune disorders and type 1 or 2 diabetes significantly increase a woman's risk of developing pre-eclampsia as does a maternal age ≥ 40 years and BMI ≥ 35 Kg/m² at first visit (Mabie, 2011; National Institute for Health and Care Excellence, 2010).</p> <p>2. Commonly encountered. Reported to occur in approximately 3% of the population although epidemiological figures vary between 2% and 8%, reflecting local case mixes (Clarke & Nelson-Piercy, 2008; Duley, 2009; Hutcheon, Lisonkova & Joseph, 2011; Queenan, Spong & Lockwood, 2007)</p>	<p>1. Occurs because of abnormal placentation and widespread endothelial cell dysfunction. May be linked to genetic predisposition, immune maladaptation or vascular mediated factors Central nervous system irritability is reflected in brisk deep tendon reflexes and clonus. Decrease in placental perfusion accompanies maternal vasospasm. Increased perinatal morbidity and mortality secondary to IUGR and the increased incidence of placental abruption. Most common cause of iatrogenic prematurity</p> <p>2. Pre-eclampsia and eclampsia are causes of maternal death in the United Kingdom (with a combined rate of 0.38 per 100, 000 maternities) and also a leading cause of severe maternal morbidity (Healthcare Improvement Scotland, 2014)</p>	<p>Monitoring: Bloods for FBC, Us and Es, uric acid, LFTS, coagulation screen and trends monitored. Reflexes monitored for signs of hyperreflexia and clonus. Fluid balance monitored / fluid restricted to prevent iatrogenic pulmonary oedema in severe pre eclampsia.</p> <p>Management is aimed at: <u>Controlling blood pressure</u>, by oral or intravenous antihypertensives (labetalol, methyldopa, nifedipine or hydralazine) as prescribed. Systolic BP ≥ 180mm Hg is an emergency situation. <u>Prevent / treat seizures</u> by administration of intravenous magnesium sulphate, with careful monitoring for magnesium toxicity. MgSO₄ mode of action: N Methyl D Aspartate (NMDA) receptors involved in seizure formation. MgSO₄ blocks NMDA receptors. Intense vasospasm is a feature of pre eclampsia and MgSO₄ is a potent vasodilator of the cerebral vasculature (Redman and Roberts, 1993) <u>Correct haematological defects with blood, platelets and FFP</u> if required <u>Monitor Fetus</u> by CTG / USS / Doppler. Monitoring of pre-load via CVP and blood pressure by arterial line may be indicated where severe pre eclampsia. <u>Expedite birth</u> (mode will depend on gestation, maternal condition and fetal wellbeing). Management protocols must be in place for the management of severe life threatening hypertension which may lead to cerebral haemorrhage and eclampsia</p>

Table A2-2 continued

Obstetric specific condition / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Clinical management / treatment summary
Puerperal psychosis	<p>1. A condition unique to childbearing women. Characterised by delusions, paranoia, hallucinations, withdrawal, severe anxiety. Often occurs early in the postnatal period (Foley, Strong & Garite, 2014)</p> <p>2. Incidence is approximately 1 in 1000 women (Royal College of Psychiatrists, 2016)</p>	<p>1. Women with previous history of the condition, or a family history of psychosis are at increased risk, as are those women who have had a diagnosis of schizophrenia (Foley, Strong & Garite, 2014). Hormonal changes, genetic influence, sleep deprivation and primiparity have all been suggested to play a part in the development of the condition (Di Florio, Smith & Jones, 2013)</p> <p>2. Risk of maternal suicide and infanticide. May take the mother 6-12 months to return to normal health and she will require intensive specialist follow up and support.</p>	<p>This is a psychiatric emergency and immediate referral to the mental health team is required (National Institute for Health and Care Excellence, 2014b). Organic causes must be excluded.</p> <p>Care of the neonate is paramount as infanticide is a potential risk (Foley, Strong & Garite, 2014).</p> <p>Specialist support, ideally in a mother and baby unit will be indicated. Antipsychotic / mood stabilising likely to be required (Royal College of Psychiatrists, 2014).</p>
Obstetric cholestasis	<p>1. A liver disease that only occurs in pregnancy and usually presents in the third trimester Aetiology –complex. It is thought that it is linked to high levels of oestrogen which causes a reduction in bile flow. This leads to raised levels of bile salts which then leads to severe pruritus</p> <p>2 0.5% - 1.5% in Europeans (Nelson Piercy and Williamson, 2007) Higher rates in Chile - 12%-22% It is possible that 'ethnic traits' explain variations Familial tendency also proposed</p>	<p>1. Bile acids may stimulate prostaglandin release and increased myometrial response to oxytocin, therefore initiating preterm labour Bile acids may also cause vasoconstriction and decreased blood flow to the fetoplacental unit with resultant fetal hypoxia. Bile acids may increase fetal colonic motility, initiating release of meconium</p> <p>2. Debate regarding raised perinatal morbidity and mortality rates. Where severe biochemical abnormalities exist induction of labour may be indicated. Fetal death often sudden and unpredicted (Royal College of Obstetricians and Gynaecologists, 2011b)</p>	<p>Serum Bile Acids – may be raised before changes in LFTs manifest. Itching may occur before the blood picture becomes abnormal - Importance of serial blood testing where there is continued pruritus Normal bile salts do not exclude OC diagnosis (RCOG, 2011d). Monitor LFTs weekly (RCOG, 2011d). Antenatal CTGs, Dopplers, as per local policy</p> <p>No treatment currently available which changes the pregnancy outcome Topical Emollients - calamine lotion, aqueous menthol cream 1% Ursodeoxycholic acid–enhances bile acid clearance across the placenta from the fetus. reduces the level of bile acids in the blood – may relieve itching and normalise biochemistry – further research required Dexamethasone – suppresses serum oestradiol levels which may indirectly assist in reducing the itching - not first line therapy Vitamin K - decreases the risk of maternal and fetal bleeding – 10mg daily by mouth</p>

Table A2-2 continued

Obstetric specific condition / complication	1. Overview 2. Incidence	1. Pathophysiology 2. Concomitant morbidity and mortality	Clinical management / treatment summary
Postpartum haemorrhage (PPH)	<p>1. Primary postpartum haemorrhage (occurring in the first 24 hours following birth) is classed as $\geq 500\text{mls}$ blood loss for national audit purposes, however major obstetric haemorrhage is declared when a woman's blood loss is greater than 1000mls (RCOG, 2009). Secondary PPH occurs 24 hours post birth and up to 12 weeks postpartum (RCOH, 2009).</p> <p>2. Variable rates have been reported.</p>	<p>Primary: Four causes; i) atonic uterus (accounts for ~ 70% of all primary PPHs) ii) retained products of conception iii) trauma – perineal tears, episiotomy, haematoma, chronic uterine inversion iv) Coagulopathy Secondary – retained products, leading to endometritis / atonic uterus.</p> <p>2. Major obstetric haemorrhage is a recognized cause of severe maternal morbidity and mortality (Baskett & O'Connell, 2005; Health Improvement Scotland, 2014; Kayem et al., 2011)</p>	<p>Control the bleeding and Resuscitate patient as clinically indicated. ABC approach. Summon experienced support – Senior midwives, Obstetric and Anaesthetic Consultants early (Lewis, 2007). Palpate the uterus, empty the bladder. Maintain normal intravascular blood volume (to avoid renal shutdown). Restore red cell mass and clotting factors as required Oxytocics / prostaglandins to treat atonic uterus (e.g. Syntometrine, Syntocinon, Hemabate, Misoprostol) (Winter et al. 2012). Early recourse to bimanual uterine compression. May require Examination under Anaesthetic (EUA). Interventional radiology may be considered. Haemostatic suturing (B-Lynch suture). Tamponade balloon may be inserted into the uterus.</p> <p>Major Obstetric haemorrhage protocol will be mobilized as required. Multidisciplinary input from Haematologist / intensivist may be required. Transfer to ICU for level two / three care may be required.</p>

Table A2-2 continued

Appendix 3

3a Delphi round one questionnaire and biographical data sheet



Notes for completion of the modified Delphi study round one questionnaire.

Part A

**Please answer the research question stated overleaf as comprehensively
as possible.**

You may use single words / phrases / statements / paragraphs. Please include all aspects you feel to be important e.g. equipment, clinical indications, education and so on. Continue overleaf and add as many additional pages as required.

Part B

Please complete the biographical data sheet overleaf as it will be of assistance in interpreting your responses in relation to the research question and in gaining an overall picture of the expert group. Please be assured that all information you provide will be treated in the strictest confidence and all responses will be anonymous.

Thank you for participating in this study. Please return your completed questionnaire and biographical data sheet in the SAE provided by *[insert date]*

Code:



Modified Delphi Study – Part A

Please answer the research question below as fully as possible:

What constitutes high dependency care in the maternity unit setting?

Answer:

Please continue overleaf / add as many additional pages as required



Code:

Modified Delphi Study – Part B

Biographical data sheet (Midwives)

Please circle the letter or letters that identify the appropriate response for each question and provide additional information where applicable.

Q1. Please identify your current professional role(s):

- a. Band six midwife (or pre Agenda for Change grade i.e. 'F')
 Specify length of time in this role.....
- b. Band seven midwife (or pre Agenda for Change grade i.e. 'G')
 (Labour Ward Co-ordinator)
 Specify length of time in this role.....
- c. Labour ward manager / matron or equivalent title (please
 state).....
 Specify length of time in this role.....
- d. Head of midwifery / equivalent title (please
 state).....
 Specify length of time in this role.....
- e. Risk manager / equivalent title (please
 state).....
 Specify length of time in this role.....
- f. Supervisor of midwives
 Specify length of time in the SOM role.....
- g. Practice development midwife or equivalent title (please
 state).....
 Specify length of time in this role.....
- h. Other (please
 state).....
 Specify length of time in this role.....

Q2. How many years of midwifery experience do you have?

- a. Under 2 years: please specify.....
- b. 2 -4 years: please specify.....
- c. 5 -7 years: please specify.....
- d. 8 – 10 years: please specify.....
- e. Over 10 years: please specify.....

Q3. What professional qualifications have you undertaken? Please circle all those that apply.

- a. Registered Midwife (3 year direct entry programme)
 Date obtained.....
- b. Registered Midwife (18 month course or 'short programme')
 Date obtained.....
- c. Registered Nurse
 Date obtained.....
- d. Enrolled Nurse
 Date obtained.....
- e. Other (please
 state).....
 Date obtained.....

Q4. What is the highest academic qualification you have achieved?

- a. Certificate level
- b. Diploma
- c. Bachelor's degree
- d. Master's degree
- e. Doctorate

Q5. Do you hold any of the following ENB post registration qualifications?

(Please specify dates obtained):

- a. ENB 997/ 998 Date obtained.....
- b. ENB 920 Date obtained.....
- c. ENB 405 Date obtained.....
- d. ENB 415 Date obtained.....
- e. ENB 100 Date obtained.....
- f. Other ENB course(s) Please specify, with date(s)
 obtained.....

- g. No ENB post registration qualifications

Q6. Have you undertaken any training, courses or study days (excluding those stated in question 5) that are relevant to the care of women requiring high dependency care in the maternity unit setting? YES / NO

(If YES – please specify below, with dates attended)

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Continue overleaf if required

End of questionnaire – thank you for your help



CODE:

Modified Delphi Study Part B

Biographical data sheet (Doctors)

Where applicable, please circle the letter or letters which identify the appropriate response(s) for each question and provide additional information as required.

Q1. Please identify your current professional role(s):

- a. Specialty Registrar in Obstetrics and Gynaecology (or equivalent title).

Specify Specialty Training (ST) Year.....

- b. Staff Grade / Trust Grade Doctor (or equivalent) in Obstetrics and Gynaecology

Specify length of time in this role.....

- c. Consultant Obstetrician with lead responsibility for the labour ward

Specify length of time in this role.....

- d. Consultant Obstetrician and Gynaecologist

Specify length of time in this role.....

- e. Specialty Registrar in Anaesthetics (or equivalent title)

Specify Specialty Training (ST) Year.....

- f. Consultant Anaesthetist with responsibility for obstetric anaesthesia

Specify length of time in this role.....

- g. Staff Grade / Trust Grade Doctor (or equivalent) in Anaesthesia

Specify length of time in this role.....

- h. Other (please specify)

.....

Specify length of time in this role.....

Q2. How long have you been a registered doctor?

- a. Under 2 years: please specify.....
- b. 2 -4 years: please specify.....
- c. 5 -7 years: please specify.....
- d. 8 – 10 years: please specify.....
- e. Over 10 years: please specify.....

Q3. Please list below the professional qualifications you currently hold with the
 dates obtained:

- Qualification.....
 Date Obtained.....
- Qualification.....
 Date Obtained.....
- Qualification.....
 Date Obtained.....
- Qualification.....
 Date Obtained.....

Q4. What is the highest academic qualification you have achieved?

- a. Bachelor's degree
- b. Master's degree
- c. Doctorate

Q5. Please list any specialist training / courses / study days that you have
 undertaken in the last 2 years, which are relevant when providing care for
 women who require high dependency care in the maternity unit setting:

Continue overleaf if required

End of questionnaire – thank you for your help



Contact details slip

It will be helpful if you are able to provide the researcher with some additional contact details (see below) if it is likely you will be changing your job over the course of the study. Please be assured these details will be known only to the researcher, stored in a locked filing cabinet and will be destroyed on completion of the study. Thank you in advance for your help which is greatly appreciated.

Printed Name

.....

Home E mail address

.....

Mobile telephone number

.....

**Additional details: e.g. name of Trust you will be moving to /
date you will be moving if known.**

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3b Excerpt from round one data analyses

Key

Text...Blue shaded - used once as data bit for category or subcategory

Text...Purple shaded - used twice or more as data bits for categories or subcategories

Text – green shaded – not coded into category or subcategory

Participant code 2P (Completed Pilot questionnaire)	Code	Subcategory / Category	Researcher memos
Allows continuity of care for peripartum woman			This is an outcome as opposed to a characteristic. Could be coded as 'ethos' of MHDC?
who is sicker than normal	Sicker than normal	Perception of risk/ Clinical Risk	What is normal in this context? Subjective assessment of the woman.
but not requiring intensive care.	Not intensive care	Subjective classification / Intervention level	This is subjective – which women do not require intensive care?
Level 2 care single (physiological system) failure	ICS levels of care – level 2	Objective classification / Intervention level	Awareness of ICS levels of care demonstrated
May be temporary e.g. in our unit (xxxx deliveries /year) or permanent facilities / bed space /equipment	Facilities Temporary versus permanent Equipment	Location / Environment Equipment / Environment	These issues relate to service delivery. Temporary = bed space with equipment. How does a permanent facility differ? This suggests different OUs may have different facilities? How can consensus be achieved if this is the case?
Should be one single room	Single room	Location / Environment	
big enough for 1 (or very rarely 2) patients	Space	Location / Environment	2 patients - does this mean one midwife cares for both women?
All relevant equipment	Equipment	Facilities	What comprises relevant in this context?
Call facilities +- telephone, +- computer terminal to access results	Equipment	Facilities / Environment	
without leaving the room	Constant presence	Staff presence	This may differentiate MHDC from one to one care in labour?
Obstetric and anaesthetic input on a formal basis (ward rounds)	Obstetrician Anaesthetist Formal ward rounds	Lead Clinician / Medical Review Medical review / Vigilance	Lead clinician or joint lead clinicians? Look for more data regarding this aspect
as well as informal visits.	Informal medical review	Medical review / vigilance	Medical review can be informal? Links with the vigilance theme
HDU training requires skill acquisition and practice by drills	Skills	Education and training / professional issues	Competence
Recognition of worsening status is important	Identifying deterioration		Physiological deterioration is featuring prominently in the pilot questionnaires. Continue to observe for this

Table A3–1 Example of a round one pilot questionnaire; transcribed, split into data bits, colour coded and analysed

Participant code 2P (Completed Pilot questionnaire)	Code	Subcategory / Category	Researcher memos
Proper charts appropriate to HDU setting. Not ward charts modified	HDU chart	Record keeping	Record keeping comprises a form of vigilance.
Early warning schemes built into charts and protocols will aid recognition of worsening clinical situation	EWS Clinical deterioration	Early Warning Scores / vigilance	Importance of detecting deterioration highlighted
requiring hourly or more frequent monitoring	Hourly observations Frequent observations	Frequency of monitoring / Vigilance	What is 'more frequent'? Keep observing for trends here.
May be invasive monitoring e.g. arterial or central venous pressures	Invasive Arterial line Invasive CVP	Invasive monitoring / Vigilance	Invasive monitoring equates with vigilance.
Patients will <u>not</u> be ventilated for level two care	Not Ventilated	Intervention	Ventilation (mechanical) equates with level 3 care according to the ICS levels of care
Midwife staffed	Midwife		Midwives provide MHDC
Should have competency in HDU care	Competence		What constitutes competency?
Extra training / experience or recognised qualifications	Midwifery education and training	Education	What does this consist of?
Concern with increased number of direct entry midwives with no basic nursing training	Concern re Direct entry midwives	Education	Issue of direct entry midwives has been raised previously in the literature. Monitor for further mention of direct entry midwives.
Constant attendance on patient	Constant attendance	Level of vigilance	

Table A-6 (continued)

Appendix 4

Delphi round two questionnaire



Notes for completion of the Delphi study round two questionnaire.

Thank you for participating in round 2 of this 3 round study.

- Please complete the rating scales on the pages overleaf by placing a ✓ in one box for each condition or statement listed. Please base your responses on your own professional opinions. Where examples have been provided they are not intended to comprise exhaustive lists.
- Add any further comments you may have in the sections allocated. If you have no further comments please leave these sections blank.
- If you anticipate that you will be moving from your current workplace in the next 3 months, it would be appreciated if you could also complete the contact details slip enclosed.
- Please return your completed questionnaire (and contact details slip if applicable) in the FREEPOST envelope by the **17th July 2009**

Sections 1 and 2: Please rate how strongly you agree or disagree that the conditions / events listed below are indications for maternity high dependency care (MHDC).

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 1					
a) Hypertensive disorders (e.g. moderate to severe pre-eclampsia, HELLP, eclampsia)					
b) Obstetric haemorrhage (e.g. antepartum haemorrhage, major post partum haemorrhage)					
c) Suspected amniotic fluid embolism					
d) Confirmed amniotic fluid embolism					
e) Obstetric cholestasis					
f) Acute fatty liver disease					
g) Gestational diabetes					
Section 2					
a) Low risk labour and delivery					
b) High risk labour (e.g. meconium stained liquor, multiple pregnancy, malpresentation, vaginal birth after caesarean section, pre term labour)					

Please provide any additional comments about the conditions / events listed in sections 1 and 2:

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Continued overleaf

Section 3: Please rate how strongly you agree or disagree that the pre-existing conditions listed below are indications for MHDC.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 3					
a) Any pre-existing medical condition present during the antenatal, intrapartum or postnatal periods					
b) Diabetes (e.g. unstable despite sliding scale insulin, ketoacidosis)					
c) Cardiac conditions (e.g. valvular heart disease cardiomyopathy, arrhythmias)					
d) Renal conditions (e.g. chronic kidney disease)					
e) Liver conditions					
f) Respiratory conditions (e.g. severe asthma)					
g) Autoimmune disorders (e.g. systemic lupus erythematosus (SLE), antiphospholipid syndrome)					
h) Central nervous system disorders (e.g. epilepsy)					
i) Haematological disorders (e.g. sickle cell disease, sickle cell crisis)					
j) History of organ transplantation					
k) Physical disabilities (e.g. causing immobility)					
l) Obesity					

Please provide any additional comments regarding the conditions listed in section 3:

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Continued overleaf

Sections 4 and 5: Please rate how strongly you agree or disagree that the complications / conditions listed below are indications for MHDC.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 4					
a) Suspected thromboembolic disorder (e.g. deep vein thrombosis or pulmonary embolism)					
b) Confirmed thromboembolic disorder (e.g. deep vein thrombosis or pulmonary embolism)					
c) Sepsis (e.g. chest infection, suspected or diagnosed septicaemia)					
d) Disseminated intravascular coagulation (DIC)					
e) Surgical complications (excluding those listed above)					
Section 5					
a) Physiological deterioration / compromise (e.g. a patient who is unstable despite the appropriate escalation of care)					
b) Signs and symptoms of shock (e.g. septic, hypovolaemic)					
c) Organ dysfunction (e.g. cardiac or respiratory insufficiency, altered renal or liver function)					
d) Organ failure (e.g. acute reversible renal failure)					
e) Maternal collapse					

Additional comments regarding the conditions / complications listed in sections 4 and 5:

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Continued overleaf

Section 6: Please rate how strongly you agree or disagree that the following clinical circumstances would lead you to classify a woman as requiring maternity high dependency care.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 6					
a) Fetal loss e.g. intrauterine death (IUD) / stillbirth					
b) Mental illness					
c) Puerperal psychosis					
d) Domestic violence					

Additional comments relating to section 6:

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Continued over

Section 7: Please rate how strongly you agree or disagree that the following clinical scenarios would lead you to classify a woman as requiring maternity high dependency care.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 7					
a) Any deviation from 'normal' progress that places the woman 'at risk' (e.g. because of obstetric factors and / or co morbidity).					
b) A woman who is considered to be at a 'high risk' of her condition deteriorating.					
c) There are serious concerns about maternal health.					
d) Any condition or complication that has the potential to threaten the life of the woman during labour or the antenatal / postnatal periods					
e) Any condition or complication that threatens the life of the woman during labour or the antenatal / postnatal periods					
f) Any condition or complication that is life threatening or potentially life threatening for the fetus					
g) A woman who is critically ill					

Additional comments relating to section 7:

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Continued overleaf

Section 8: In relation to the observation and monitoring of women, please rate how strongly you agree or disagree that the statements below represent features of maternity high dependency care.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 8					
a) Monitoring of vital signs more frequently than 4 hourly but not more frequently than hourly.					
b) Monitoring of vital signs more frequently than hourly (e.g. every 5 – 30 minutes)					
c) Vital signs monitored continuously.					
d) Non invasive monitoring of pulse, blood pressure respiratory rate, oxygen saturations (pulse oximetry, temperature)					
e) Continuous ECG monitoring					
f) Level of consciousness monitored / neurological observations performed at regular intervals as indicated					
g) Accurate monitoring of fluid balance (e.g. catheter on hourly urine measurements)					
h) Observation of blood loss					
i) Invasive monitoring - Central Venous Pressure (CVP) line					
j) Invasive monitoring – arterial line					
k) Invasive monitoring – pulmonary artery flotation catheter (i.e. Swan Ganz lines)					
l) Use of early warning systems (e.g. MEWS, MEOWS, Patient at Risk (PAR) scoring)					

Additional comments relating to section 8:

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Continued overleaf

Section 9: Please rate how strongly you agree or disagree that the statements below are indicators of maternity high dependency care.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 9					
a) One to one care (one trained member of staff provides care for one patient)					
b) At least one trained member of staff per 2 patients					
c) Constant attendance of a trained member of staff					
d) Regular and formal medical reviews, minimum of 4 – 6 hourly					
e) Informal medical reviews in addition to formal reviews					
f) Lead clinician - Consultant obstetrician (i.e. care managed by a consultant rather than a specialty registrar / staff grade or equivalent.)					
g) Lead clinician - Consultant anaesthetist (i.e. care managed by a consultant rather than a specialty registrar / staff grade or equivalent)					
h) Joint lead clinicians – Consultant anaesthetist and consultant obstetrician					
i) Regular and frequent clinical investigations (e.g. blood testing, arterial blood gas measurements)					
j) Increased use of imaging (e.g. X-rays, ultrasound scanning)					
k) Recording of observations on high dependency/ intensive care charts (paper copies)					
l) Use of electronic high dependency charts that have direct links to haematology, biochemistry etc..					

Additional comments relating to section 9:

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Continued overleaf

Section 10: Please rate how strongly you agree or disagree that the interventions listed below are components of maternity high dependency care.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 10					
a) Step down care following a period in intensive or coronary care.					
b) Immediate post operative care (e.g. during the first hour post caesarean section)					
c) Routine post operative care undertaken up to 24 hours post caesarean section					
d) Prolonged post operative care because of unsatisfactory patient recovery (e.g. patient has not recovered in timely and appropriate manner)					
e) Devising a structured plan of care that is reviewed and updated regularly					
f) Frequent treatment episodes - hourly or more frequently					
g) Referral to specialist medical staff as required (e.g. radiologist, haematologist, cardiologist etc)					
h) Referral to paramedical staff (e.g. physiotherapist, Operating Department Practitioner)					
i) Referral to nurses (excluding critical care nurses) (e.g. theatre / anaesthetic nurses)					
j) Involvement of critical care outreach team / intensive care unit					
k) Transfer of the patient (e.g. to intensive care unit or coronary care as required)					
l) The administration of intravenous anticonvulsants (e.g. magnesium sulphate)					
m) The administration of intravenous antihypertensives (e.g. labetalol)					
n) The administration of intravenous oxytocics (e.g. syntocinon)					
o) The administration of inotropes / vasopressors (e.g. dopamine)					
p) The administration of intravenous fluids and blood products					
q) The administration of an insulin infusion					
r) The administration of tocolytics (e.g. atosiban for preterm labour)					

Continued overleaf

Section 10 continued: Please rate how strongly you agree or disagree that the interventions listed below are components of maternity high dependency care

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 10 continued					
s) Drugs and / or fluids administered via a central line					
t) Continuous oxygen therapy (e.g. > 50% given by face mask)					
u) Continuous oxygen therapy < 50% given by face mask)					
v) Epidural anaesthesia administered for pain relief during labour					
w) Epidural anaesthesia, excluding pain relief during labour (e.g. postnatal analgesia)					
x) Non invasive ventilation e.g. CPAP or BIPAP					
y) Intubation and ventilation					
z) Renal support					
zi) Routine postnatal care (e.g. fundal height, lochia)					
zii) Thromboprophylaxis (excluding anticoagulants) (e.g. anti embolic stockings)					
ziii) Pressure area care					
ziv) Care of the neonate (where applicable)					
zv) Monitoring of the pregnancy or labour (e.g. fetal monitoring, ultrasound scanning)					
zvi) Patient support (psychological) and advice					
zvii) Support for the woman's family					

Additional comments relating to the interventions listed in section 10:

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.....please continue overleaf as required

Final section overleaf →

Section 11a: Please rate how strongly you agree or disagree that the following statements describe MHDC:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 11a					
a) Care that falls outside of 'normal' or 'routine' maternity care					
b) An interim level of care that falls between 'normal' maternity care and 'intensive' care					
c) Specialist care that is not intensive care					
d) It is the same care as is offered in for example, intensive care units					

Are you familiar with the Intensive Care Society's 'Levels of Critical Care for Adult Patients' classification system? (Please tick your response in one of the shaded boxes opposite)	Yes	No
If you have answered 'yes' to this question, please complete section 11b below. If you have answered 'no' to this question, you have finished the questionnaire – thank you very much for your help.		

Section 11b: Please rate how strongly you agree or disagree that the following statements describe MHDC:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Section 11b					
a) Level 1 care as defined by the Intensive Care Society in 2009 (e.g. patient requiring a minimum of 4 hourly observations, demonstrating abnormal vital signs but not needing a higher level of critical care)					
b) Level 2 care as defined by the intensive Care Society in 2009 (e.g. extended postoperative care, a minimum of hourly observations, patients who are having a single organ system supported)					
c) Level 3 care as defined by the Intensive Care Society in 2009 (e.g. patients with 2 or more organs being supported)					

Additional comments relating to section 11:

.....please continue overleaf as required

End of questionnaire Thank you for completing this questionnaire.
Your help is greatly appreciated.

Appendix 5

Delphi round three Questionnaire

CODE:

Round 3 MHDC questionnaire. Version 1 20/11/09 REC reference: 08/H0203/12



Section 1		
Q1. Patients with the following conditions or interventions should be cared for on an intensive care unit;	Please circle your response	Additional comments (optional)
Severe obstetric conditions (e.g. severe pre eclampsia, HELLP, eclampsia, major obstetric haemorrhage, acute fatty liver disease)	Yes No	
Suspected amniotic fluid embolism	Yes No	
Confirmed amniotic fluid embolism	Yes No	
Disseminated intravascular coagulation	Yes No	
Physiological deterioration / compromise (unstable patient despite escalation of appropriate care e.g. clinical organ dysfunction, organ failure, shock)	Yes No	
Continuous ECG monitoring and / or neurological observations required	Yes No	
Invasive monitoring – arterial line	Yes No	
Invasive monitoring – pulmonary artery flotation catheter (Swan Ganz lines)	Yes No	
Administration of inotropes / vasopressors (e.g. dopamine)	Yes No	
Drugs and / or fluids administered via a central line	Yes No	
Continuous oxygen therapy (e.g. > 50% given by face mask)	Yes No	
Continuous oxygen therapy (e.g. < 50% given by face mask)	Yes No	
Non invasive ventilation e.g. CPAP or BIPAP	Yes No	
Intubation and ventilation	Yes No	
Renal support	Yes No	

CODE:

Section 2	Please tick appropriate response					Additional comments (optional)
Q1. Please rate how strongly you agree or disagree the clinical scenarios listed below are indications for Maternity High Dependency Care (MHDC)	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree	
Obstetric conditions such as obstetric cholestasis or gestational diabetes where the woman is clinically stable						
Clinical instability due to a pre existing condition(s) (e.g. diabetes, cardiac, renal, liver, respiratory, haematological disorders)						
Presence of severe pre existing condition(s) (e.g. diabetes, cardiac, renal, liver, respiratory, haematological disorders) where the woman is clinically stable.						
Autoimmune disorder / central nervous system disorder where woman is clinically unstable						
History of organ transplantation - stable patient						
Morbid obesity						
Suspected PE						
Confirmed PE						
Severe sepsis e.g. septicaemia						
Acute surgical complication e.g. peritonitis / bowel obstruction						
'Step down care' required post ICU or CCU admission						
Prolonged post operative care because of unsatisfactory patient recovery (patient has not recovered in a timely and appropriate manner)						
A woman receiving IV anti hypertensives (e.g. labetalol)						
Serious concerns regarding maternal health, e.g. a woman may be at high risk of deteriorating or has a condition with life threatening potential.						

CODE:

Section 2	Please tick appropriate response					Additional comments (optional)
Q2. Please indicate how strongly you agree or disagree with the following statements	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree	
High risk labour (e.g. multiple pregnancy malpresentation, vaginal birth after caesarean section, pre term labour) on its own, is not an indication for MHDC.						
Women with puerperal psychosis need psychiatric perinatal services as opposed to MHDC.						
Non invasive monitoring e.g. BP, resps, continuous ECG, level of consciousness, fluid balance, observation of blood loss, will be performed as part of MHDC where clinically indicated.						
Monitoring of vital signs more frequently than 4 hourly but not more frequently than hourly is a feature of MHDC.						
An early warning scoring system e.g. (MEWS, MEOWS, Patient at Risk (PAR) should be used for all women receiving MHDC.						
One to one care (with a professional in constant attendance) is a characteristic of MHDC.						
Regular medical reviews are a characteristic of MHDC.						
Joint lead clinicians (a consultant obstetrician and consultant anaesthetist) are a feature of MHDC.						
Regular and frequent investigations e.g. bloods, ABG, imaging are used on an individualised basis during MHDC.						
Immediate post operative care (e.g. first hour post LSCS) does not constitute MHDC.						
Referral (as required) to specialist medical staff and or the critical care outreach team / intensive care unit are components of MHDC.						
Referral (as required) to paramedical staff e.g. physiotherapist, ODP or nurses (excluding critical care nurses) are components of MHDC.						



Section 2	Please tick appropriate response					Additional comments (optional)
Q3. Please indicate how strongly you agree or disagree with the following statements	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree	
The administration of IV fluids, blood products, IV oxytocics, tocolytics and insulin are components of routine maternity care that may be also used in MHDC.						
A woman needing epidural anaesthesia, excluding pain relief during labour (e.g. postnatal pain relief) will not be classed as receiving MHDC.						
Routine care (e.g. pressure area care, patient / family support) will be performed as part of MHDC.						
MHDC is more likely to be undertaken for maternal than fetal reasons.						
MHDC is an interim level of care for women requiring interventions over and above the specialised 'high risk' care that will be carried out routinely on a consultant led labour ward, but not requiring care on an intensive care unit.						
MHDC will be implemented where a patient has deteriorated clinically but her care can be managed appropriately on the labour ward.						

End of final questionnaire. Thank you for your help which, is greatly appreciated.

Please enter your e-mail address if you would like a copy of the results

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Appendix 6

Rationale for the Delphi round two statements included or excluded from the round three questionnaire

Question number		Median score (IQR)	SA/A %	Inclusion in Delphi Round 3 (Yes or No) with a brief rationale
1a	Raised BP	5 (1)	98.6	Yes. Into the round 3 'is ICU required section'. Intensive care may be a more suitable location to care for a woman with this type of condition.
1b	Haemorrhage	5 (0)	97.3	Yes. Into 'is ICU required section' in response to qualitative comments
1c	Suspected AFE	5 (0)	93.3	Yes. Into 'is ICU required section' in response to qualitative comments
1d	Confirmed AFE	5 (0)	97.2	Yes. Into 'is ICU required section' in response to qualitative comments
1e	Obstetric Cholestasis	3 (2)	33.8	Yes (median 3)
1f	Acute fatty liver	5 (1)	85.1	Yes. Into 'is ICU required section' in response to qualitative comments
1g	Gestational diabetes	3 (2)	31.1	Yes (median 3)
2a	Low risk labour	1 (1)	1.4	No (median 1)
2b	High risk labour	3 (2)	31.1	Yes (median 3)
3a	Any co morbidity	3 (1)	12.2	Yes (median 3)
3b	Unstable diabetes	4 (1)	94.6	Yes, but combined with 3c, 3d, 3e, 3f and 3i qualitative comments raised issues of stability and severity
3c	Cardiac conditions	4 (1)	83.8	As for 3b
3d	Renal conditions	4 (2)	56.7	As for 3b
3e	Liver conditions	4 (1)	50.0	As for 3b
3f	Respiratory conditions	4 (1)	64.9	As for 3b
3g	Autoimmune disorders	3 (1)	41.9	Yes (median 3) incorporated with 3h and instability added
3h	CNS disorders	3 (2)	27.0	Yes (median 3) incorporated with 3g and 'instability' added in relation to respondent comments
3i	Haematological disorders	4 (1)	59.5	As for 3b
3j	Organ transplantation	4 (1)	62.1	Yes, no consensus by ≥80%
3k	Physical disabilities	2 (1)	19.0	No (median 2)
3l	Obesity	3 (2)	33.8	Yes (median 3) changed to 'morbid' in response to qualitative comments
4a	Suspected DVT/PE	3 (1)	47.3	Yes (median 3)
4b	Confirmed DVT/PE	4 (1)	83.7	Yes – debate re DVT
4c	Sepsis	4 (1)	95.9	Yes – comment re severity influencing type of care required
4d	DIC	5 (0)	95.9	Yes. Into 'is ICU required section' in response to qualitative comments
4e	Surgical complications	4 (2)	71.6	Yes – in response to qualitative comments and no consensus at the ≥80%
5a	Physiological compromise	5 (1)	94.6	Yes. Into 'is ICU required section' in response to qualitative comments
5b	Signs / symptoms of shock	5 (0)	97.3	Yes. Into 'is ICU required section' in response to qualitative comments
5c	Organ dysfunction	5 (1)	93.3	Yes. Into 'is ICU required section' in response to qualitative comments
5d	Organ failure	5 (0)	96.0	Yes. Into 'is ICU required section' in response to qualitative comments
5e	Maternal collapse	5 (0)	94.6	No (consensus with no comments)

Table A6-1 Rationale for Delphi round two statements being included or excluded from the round three questionnaire

Question number		Median score (IQR)	SA/A %	Inclusion in Delphi Round 3 (Yes or No) with a brief rationale
6a	Fetal loss	2 (1)	18.9	No (median 2)
6b	Mental illness	3 (1)	43.3	No – too vague for further inclusion
6c	Puerperal psychosis	4 (2)	52.7	Yes – comments about perinatal mental health services
6d	Domestic violence	2 (1)	63.5	No (median 2)
7a	At risk due to deviation from norm	3 (2)	28.4	No (median 3) but very vague.
7b	High risk of deterioration	4 (1)	56.7	Yes, no consensus by percentage, merged with 7c and 7d
7c	Serious concerns re maternal health	4 (2)	70.2	Yes, no consensus by percentage, merged with 7b and 7d
7d	Condition with life threatening potential	4 (1)	75.7	Yes, no consensus by percentage, merged with 7b and 7c.
7e	Condition threatening maternal life	5 (1)	89.2	No – consensus achieved
7f	Condition threatening fetal life	4 (2)	67.6	Yes – new statement reworded in response to comments
7g	Woman who is critically ill	5 (0)	93.3	Yes – but encompassed by more specific statements in round 3 ICU questions.
8a	Vital signs < 4hrly but > or = hourly	3 (2)	40.6	Yes – included as question re 'step down care'
8b	Vital signs < hourly	4.5 (1)	86.5	No – consensus achieved
8c	Continuous monitoring vital signs	5 (1)	90.6	No – consensus achieved
8d	Non invasive monitoring e.g. BP, respiratory rate	4 (2)	60.8	Yes, combined with 8e, 8f, 8g and 8h
8e	Continuous ECG	4 (1)	86.4	Yes, as per 8d. ICU required?
8f	Level of consciousness	4 (1)	86.4	Yes, as per 8d / ICU?
8g	Fluid balance	4 (1)	79.7	Yes, as per 8d
8h	Observe blood loss	4 (3)	56.7	Yes, as per 8d
8i	Invasive monitoring i.e. CVP	5 (1)	82.4	Yes (ICU required?)
8j	Invasive monitoring arterial line	5 (1)	82.5	Yes (ICU required?)
8k	Swan Ganz monitoring	5 (2)	70.3	Yes (ICU required?)
8l	Use of Early Warning Score	4 (2)	63.5	Yes – stimulated debate in round two
9a	One to one care	4 (3)	62.1	Yes -combined with 9c to take into consideration qualitative comments
9b	One staff per 2 patients	2 (2)	29.7	No (median 2)
9c	Constant attendance of staff	4 (1)	77.0	Yes -combined with 9a to take into consideration qualitative comments
9d	Formal medical reviews 4-6 hourly	4 (1)	77.0	Yes – combined with 9e
9e	Informal medical reviews	4 (1)	64.9	Yes – combined with 9d
9f	Lead clinician consultant obstetrician	4 (2)	66.2	No
9g	Lead clinician consultant anaesthetist	4 (2)	71.6	No
9h	Joint lead clinicians	4 (3)	85.1	Yes – reworded as 'feature' in response to comments
9i	Regular and frequent investigations	4 (1)	85.1	Yes – reworded to include individual patient basis (+merged with 9j)
9j	Increased use of imaging	4 (1)	59.8	Yes – reworded to include individual patient basis and merged with 9i
9k	Recording of observations on HDU/ICU chart	5 (1)	91.9	No – consensus achieved
9l	Use of electronic charts	4 (2)	68.9	No – removed – not available in all units

Table A6-1 Rationale for Delphi round two statements being included or excluded from the round three questionnaire (continued)

Question number		Median score (IQR)	SA/A %	Inclusion in Delphi Round 3 (Yes or No) with a brief rationale
10a	Step down care post ICU/CCU	4 (1)	93.3	Yes – can it be an indication?
10b	Immediate post operative care	3 (2)	47.3	Yes (median 3)
10c	Routine post op care up to 24 hours post LSCS	2 (1)	10.8	No (median 2)
10d	Prolonged post operative care > 24 hours	4 (1)	71.6	Yes – reworded as indication for MHDC
10e	Structured and regularly updated care plan	4 (1)	58.1	No – vague / 'applies to all aspects of care'
10f	Frequent treatment episodes	4 (1)	73.0	No – vague
10g	Referral to specialist medical staff	4 (0)	75.7	Yes – merged with 10j (reworded to say as required in response to qualitative comments)
10h	Referral to paramedical staff	3 (2)	41.9	Yes - merged with 10i
10i	Referral to nurses (excluding critical care nurses)	3 (2)	40.5	Yes merged with 10h
10j	Involvement of critical care outreach team or ITU	4 (1)	90.6	Yes – merged with 10g (reworded to say 'as required' in response to qualitative comments)
10k	Transfer of patient e.g. to CCU	5 (1)	90.5	No – consensus achieved
10l	Administration of IV anticonvulsants	5 (1)	93.2	No – consensus achieved
10m	Administration of IV antihypertensive	4 (1)	89.2	Yes – Moved from a component of MHDC to an indication for MHDC
10n	Administration of IV oxytocics	3 (2)	27.0	Yes – merged with 10p, q and r
10o	Administration of inotropes / vasopressors	4 (1)	86.5	Yes (ICU required?)
10p	Administration of IV fluids / blood products	3 (2)	41.9	Yes – merged with 10n, q and r
10q	Administration of insulin infusion	4 (1)	51.3	Yes – merged with 10n, p and r
10r	Administration of tocolytics	3 (2)	35.1	Yes – merged with 10n, p and q
10s	Drugs / fluids via central line	5 (1)	87.8	Yes (ICU required?)
10t	Oxygen therapy >50% by face mask	4 (2)	72.9	Yes (ICU required?)
10u	Oxygen therapy <50% by face mask	4 (1)	62.2	Yes (ICU required?)
10v	Epidural anaesthesia for pain relief in labour	2 (2)	29.7	No (median 2)
10w	Epidural analgesia excluding labour	3 (2)	29.7	Yes (median 3)
10x	Non invasive ventilation	4 (1)	78.4	Yes (ICU required?)
10y	Intubation and ventilation	5 (1)	78.4	Yes (ICU required?)
10z	Renal support	5 (1)	80.5	Yes (ICU required?)
10zi	Routine postnatal care	2 (3)	24.3	No (median 2)
10zii	Thromboprophylaxis	2 (2)	31.1	No (median 2)
10ziii	Pressure area care	3 (2)	40.5	Yes – merged with 10zvi and 10zvii
10ziv	Care of neonate	2 (2)	35.1	No (median 2)
10zv	Monitoring of pregnancy or labour	2 (2)	32.4	No (median 2)
10zvi	Patient support	3 (2)	39.2	Yes – merged with 10ii and 10zvii
10zvii	Support for woman's family	3 (2)	44.6	Yes – merged with 10zvi and 10ziii
11a	Care that falls outside normal maternity care	3 (2)	47.3	Yes – merged with 11b, 11c, 11d
11b	Interim level of care between normal and intensive care	4 (0)	83.8	Yes – merged with 11a, 11c, 11d
11c	Specialist care that is not intensive care	4 (0)	77.0	Yes – merged with 11a, 11b, 11d
11d	Same care as is offered in ICU	3 (2)	37.8	Yes – merged with 11a, 11b, 11c.

Table A6-1 Delphi round two statements included in or removed from the round three questionnaire (continued)

Appendix 7

Focus Group study, biographical data sheet and questionnaire

Date..... Hospital Code

Midwife Initials	
Year of qualification as a midwife	
Grade	6 / 7
3 year (direct entry) or shortened midwifery programme?	Direct / Shortened
Any High Dependency / Critical Care training undertaken	Yes / No If yes – please specify:

Scenario one

1. What do you want to do in terms of care escalation?

2. Why?

(These two questions were repeated for scenarios two and three)

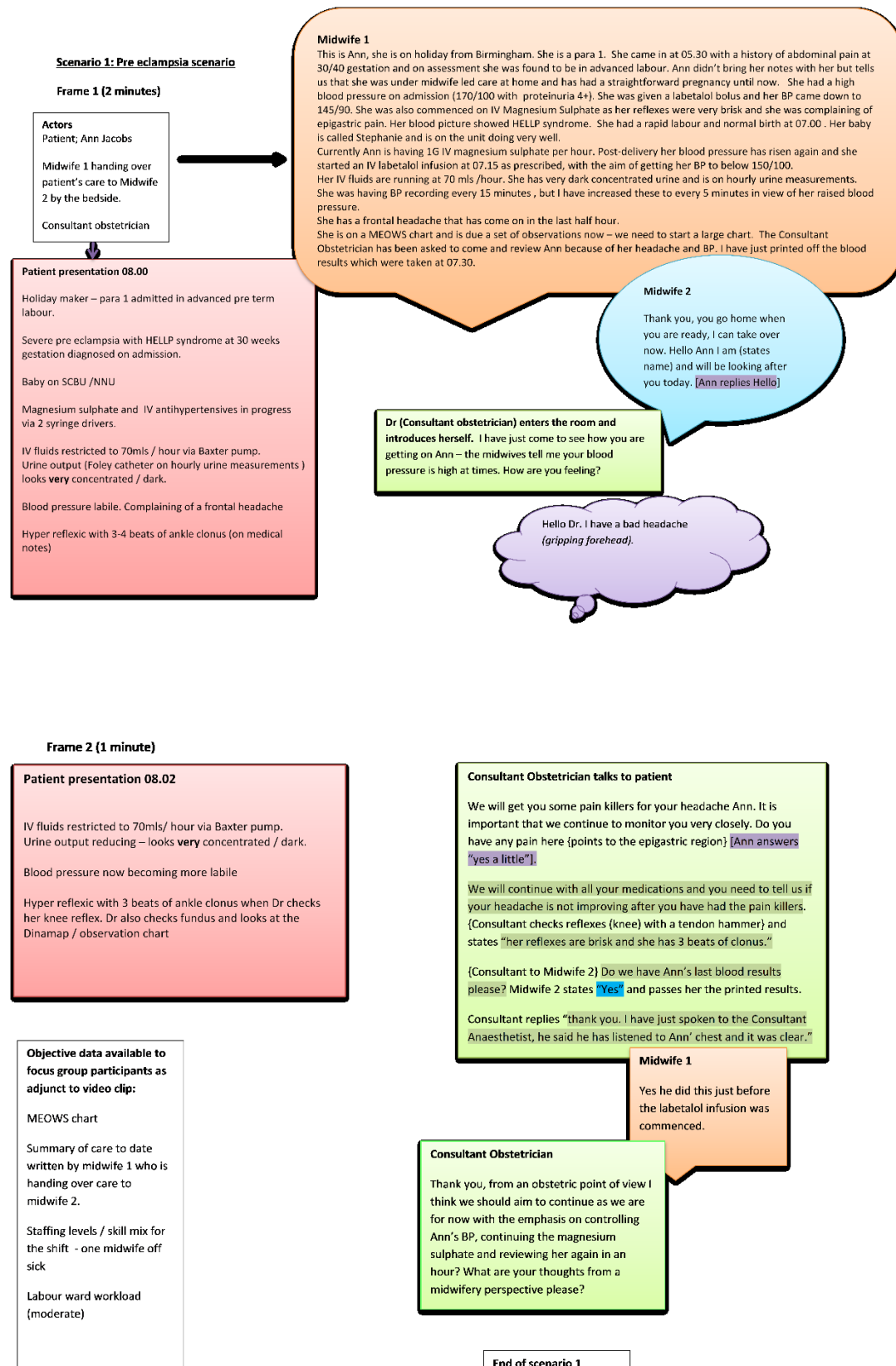
Appendix 8

8a Story boards and objective data for Focus Group study scenarios

Scenario One overview	Scenario two overview	Scenario three overview
Severe pre eclampsia at 30/40 gestation Vaginal birth 90 minutes previously Magnesium sulphate / IV anti hypertensives in progress High BP Hyper reflexic, 4 beats of clonus. Headache Blood picture shows HELLP syndrome Unstable in terms of raised BP, blood picture and neurological examination	Primary PPH On-going management after initial emergency treatment Blood transfusion being given. CVP in situ as poor peripheral access Hourly CVP readings requested to guide fluid replacement Stable BP, pulse Reduced urine output	Cardiac comorbidity Raised BMI Type II diabetes Suspected PE / cardiac issue at 32 /40 Needing < 50% oxygen to maintain oxygen saturations Stable vital signs whilst patient has oxygen therapy in progress, but at risk of deterioration. Continuous ECG requested
Actors		
Midwife 1 KM Midwife 2 CM Consultant Obstetrician ES Patient FP	Midwife 1 SL Midwife 2 FP Patient CM	Midwife 1 CM Midwife 2 SM Patient KM
Notes		
08.00 at start of scenario Left cannula Magnesium sulphate (10 grams mag sulphate in 50mls) via syringe pump at 5 ml /hour (35 mls left in syringe) Normal saline 500 mls bag running at 70 mls /hour Right cannula IV labetalol via syringe pump (40mls labetalol 5mg/mls) running at 8ml /hour (36 mls labetalol left in syringe) Hourly urine measurements – urine very dark (haemolysis) – 5 mls in burette only as just emptied	21.22 at start of scenario Left Cannula – syntocinon 40IU in 500 mls Normal saline via pump Right side cannula – blood – 1/3 bag left dripping very slowly CVP - not attached to fluids Foleys attached to hourly urine – urine quite concentrated – 5 mls in burette	15.00 at start of scenario Oxygen at 4L per minute via face mask Continuous ECG – normal sinus rhythm (pulse 92) Cannula – wide bore x 1 Respiratory rate 18/minute

Table A8-1 Set up instructions for the three scenarios and allocation of actors

Story Board Scenario One



Scenario one

Objective data: Excerpt from patient notes.

Name Ann Jacobs Hospital number 87654381 DOB 14/02/1978

Midwife 1 handing over to midwife 2 - Summary of Ann's care to date at 07.55, 6th July 2013:

Ann was admitted to Labour Ward at 05.30. She did not have her hand held notes with her (holidaymaker). Para 1 (previous normal delivery). No past or current medical / obstetric histories of note. Medication – none. Allergies – none. History of abdominal pains and headache for 6 hours. 30/40, found to be 8cms dilated when examined. BP 170/100 on admission with 4+ protein in urine.

Normal birth at 07.00. Third stage completed in 5 minutes, placenta appeared complete. EBL 250mls. Baby girl born in good condition requiring special care for prematurity.

Ann has received the following medications:

- IV syntocinon 5IU slow bolus (active management of 3rd stage of labour)
- IV Magnesium sulphate 4g bolus given over 20 minutes at 06.00 followed by a 1g/hour infusion (in progress).
- Labetalol bolus IV as per protocol before delivery.
- Labetalol infusion 5mg/ml. Infusion commenced at 4ml /hr at 0715. Increased to 8 ml/ hr at 07.45 as BP remained high.
- IV Hartmanns, restricted fluids at 70 mls/hr via pump since 06.00.

Foleys catheter in situ on hourly urine measurements – urine very dark (60 mls output in preceding 2 hours).

5 minutely blood pressure recording on MEOWS chart.

Lochia moderate and fundus well contracted at this time.

08.00 Consultant obstetrician review – very brisk reflexes and 3-4 beats of clonus on examination. Needs analgesia for headache.

Scenario one

Objective data: Observation chart

OBSTETRIC EARLY WARNING CHART. FOR MATERNITY USE ONLY

NAME: ANNA JACOBS DOB: 14/2/78 Normal Birth 0700
 CHI: 87654381 WARD: LABOUR IV MgSO4 in progress
IV LABETALOL 0715

CONTACT DOCTOR FOR EARLY INTERVENTION IF PATIENT TRIGGERS ONE RED OR TWO YELLOW SCORES AT ANY ONE TIME

Date:	Time:	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
RESP (write rate in corresp. box)	>30																					
	21-30																					
	11-20	16					16							16								
	0-10																					
Saturations	90-100%	97					98						98									
	<90%																					
O2 Conc.	%	AIR					AIR						AIR									
Temp	39																					
	38																					
	37	36.6											36.6									
	36																					
	35																					
HEART RATE	170																					
	160																					
	150																					
	140																					
	130																					
	120																					
	110																					
	100																					
	90																					
	80																					
	70																					
	60																					
	50																					
	40																					
	30																					
	20																					
	Systolic blood pressure	200																				
190																						
180																						
170																						
160																						
150																						
140																						
130																						
120																						
110																						
100																						
90																						
80																						
70																						
60																						
50																						
Diastolic blood pressure		130																				
	120																					
	110																					
	100																					
	90																					
	80																					
	70																					
	60																					
	50																					
	40																					
	30																					
	20																					
	10																					
	0																					
	Placenta (Uterine)	Y or N																				
		Y or N																				
	Lochia	Normal																				
Heavy / Foul																						
Proteolysis	> 2+																					
	> 2+																					
Liquor	Clear / Pink																					
	Green																					
NEURO RESPONSE (-)	Alert																					
	Voice																					
Pain Score (no-3)	2-3																					
	0-1																					
Nausea (v)	YES (v)																					
	NO (v)																					
Looks unwell	YES (v)																					
	NO (v)																					
Total Yellow Scores																						
Total Red Scores																						

Scenario one

Objective data: Laboratory results

Ann Jacobs
87654381
DOB 14/02/1978

Date	Pregnancy Reference Range	05/07/13	05/07/13
Time		05.30	07.30
Haemoglobin	>10g/dl	13.2	10.0
White cells	4-12	5.8	5.3
Platelets	> 150	90	60
Mean Corpuscular Volume (MCV)	80-97	94.4	78.2
Sodium	136-145 mmol/L	140	141
Potassium	3.5-5.2 mmol/L	4.0	4.8
Chloride	95 -107 mmol/L	103	102
Urea	2.8 -7.6 mmol/L	7.0	7.8
Creatinine	<85 µ/L 1 st 2 nd trimester <90 µ/L in 3 rd trimester	95	103
Total protein	60-80	67	50
Albumin	23-31 g/L	27	20
ALT	6-32 iu/L	740	880
Urate (Uric acid)	Value linked to gestation	0.46	0.51
Total bilirubin	3-14 µ/L	30	33
C Reactive Protein (CRP)	<10mg/L	5	5.1
Protein: Creatinine ratio	<45	Not back	Not back
24hr urine collection			
Midstream specimen urine (MSU)		taken	
Clotting screen		Normal limits	Normal limits

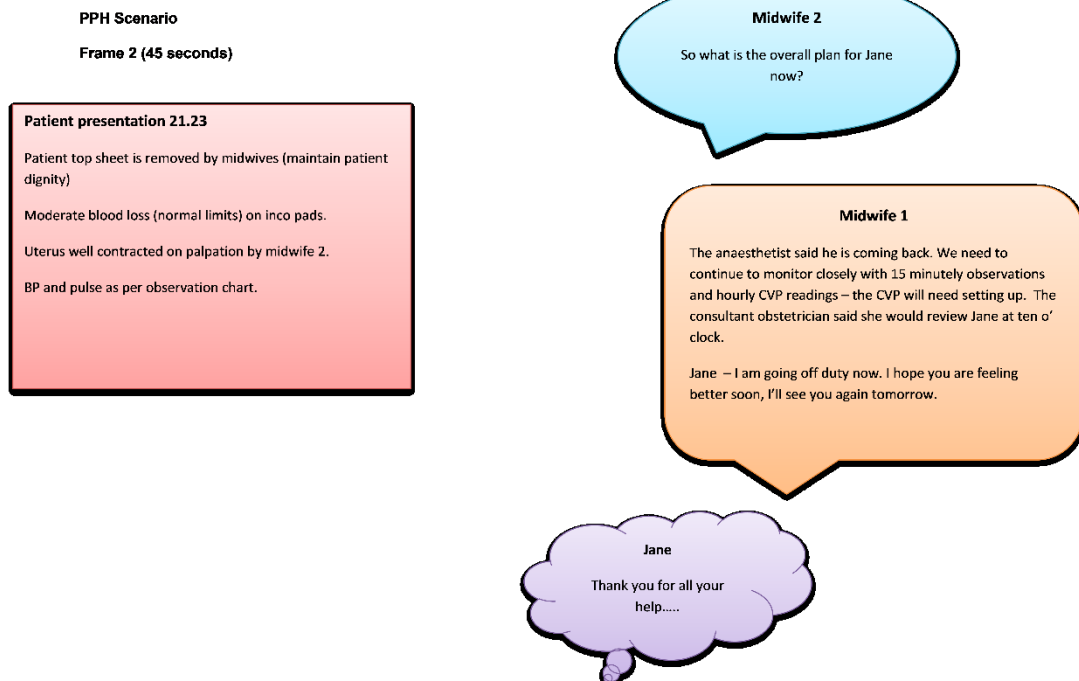
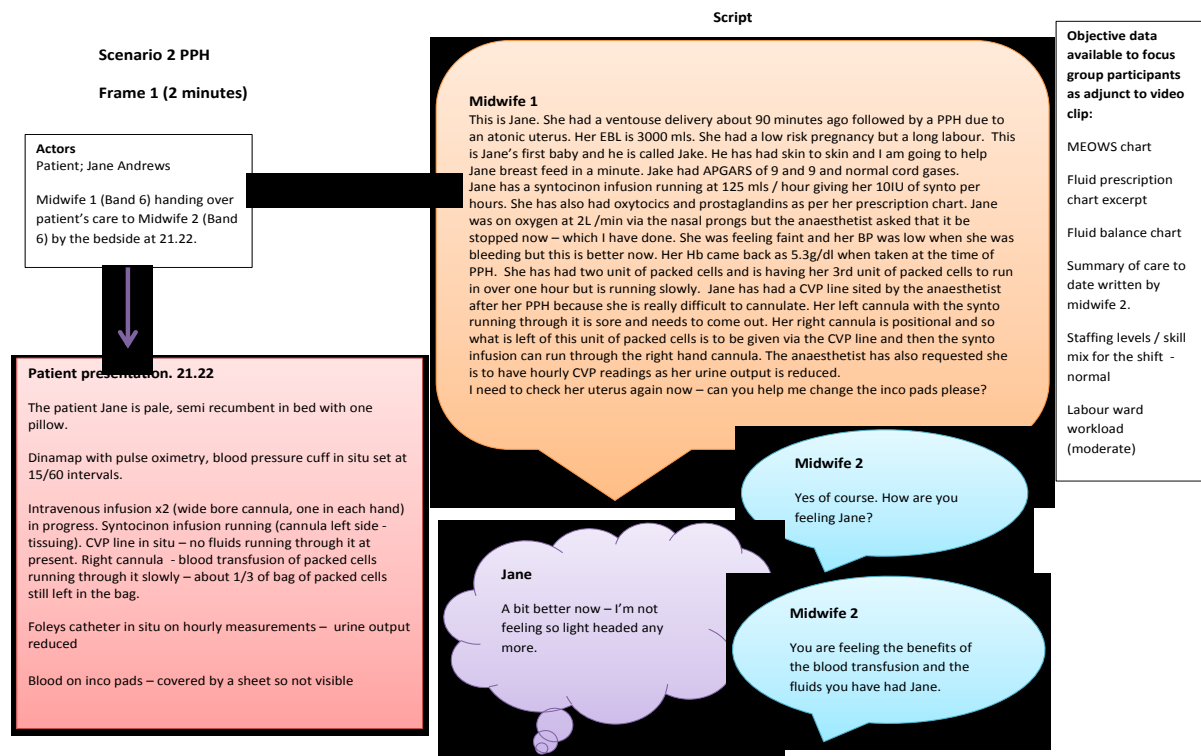
Objective data: Staffing levels (Scenario 1)

Correct number of midwives on duty for the maternity unit in question.

Full quota of Band 6 midwives with one Band 7 midwife coordinating.

Workload – moderate. All women on the labour ward are in labour – mainly low risk.

Story Board Scenario Two



Patient presentation 21.18

No change in terms of treatment /
interventions / patient position.

Midwife 2 (FP)

OK Jane, I am going take a few moments to read through and
write in your notes. Then I will check your temperature and help
you to breast feed. The anaesthetist should be back in a moment.

Scenario two

Objective data: Excerpt from patient notes.

Name Jane Andrews
Hospital number 1234567
DOB 07/08/78

Midwife 2 taking over care from midwife 1 at 21.25, 01/07/13. Summary of Jane's care to date:

Low risk term pregnancy. Long labour augmented with IV syntocinon (deflexed OP position). Ventouse delivery under epidural anaesthesia at 18.23 for a prolonged second stage and suspicious CTG. Episiotomy sutured by obstetric registrar.

Severe PPH (EBL 3000 mls) due to atonic uterus following active management of the third stage at 18.30 today. (Placenta appeared complete)

Has had the following medications / interventions at the time of the PPH;

- Ergometrine 500 mcg IV one dose
- Hemabate 2 doses deep IM 15 minutes apart
- Syntocinon infusion 10IU per hour (currently in progress through left hand cannula but this is sore and needs removing)
- Early bimanual compression
- CVP line sited by anaesthetist as **very** difficult to obtain peripheral venous access and also to guide fluid replacement.

Has had 3 litres of Hartmanns and two units of packed cells to date. Another unit of packed cells currently in progress (right cannula) but cannula very positional and remainder of this unit to be given via the central line at anaesthetist's request.

Foleys catheter on hourly urine measurements. Urine output last hour 20mls.

5-10 minutely observation on MEOWS chart – may be recorded every 15 mins now.

CVP line – to commence hourly CVP measurements as per anaesthetist's instruction (monitor etc. required)

Lochia moderate and fundus well contracted at this time.

Plan; To discuss on-going management / care with relevant staff.

Objective data: Observation chart

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Scenario two

Objective data: Infusion Therapy Sheet

JANE ANDREWS 1234567 LABOUR WARD

INFUSIONAL THERAPY SHEET											
Date	Line	Additive drug (not for blood products) Fluid or blood product & Batch number	Dose Volume	Duration	Rate	Loading dose? (✓)	Signature & Bleep	Start time End time	Device Batch No.	Given by Added by	Checked by
1/7/13	IV	Hartmanns	1000mls	4			DR.	1100		MW	MW
1/7/13	IV	Hartmanns	1000mls	4			DR.	1400		MW	MW
1/7/13	IV	Normal Saline	500mls		via pump		DR.	1410		MW	MW
1/7/13	IV	Syntocinon	20IU		as per protocol						
1/7/13	IV	HARTMANN'S	1000mls	Stat			DR.	1830		MW	MW
1/7/13	IV	HARTMANN'S	1000mls	Stat			DR.	1845		DR	
1/7/13	IV	HARTMANN'S	1000mls	Stat			DR.	1900		DR	
1/7/13	IV	PACKED CELLS	10	Stat			DR.	1930		DR	
1/7/13	IV	Donation No G0555612 F2		Stat			DR.	1950		DR	
1/7/13	IV	PACKED CELLS	10	Stat			DR.	1950		DR	
1/7/13	IV	Donation No GR 355414 SP		Stat			DR.	2020		MW	
1/7/13	IV	PACKED CELLS	10	1hr			DR.	2020			
1/7/13	IV	Donation No. GR 124655 NP									
1/7/13	IV	Normal Saline	500mls	4hrs			DR.				
1/7/13	IV	Syntocinon	40IU		125ml/hr		DR.	1840		MW	MW
1/7/13	IV	500mls N/Saline			via pump						
12											
13											
14											
15											
16											

Scenario two

Objective data: Fluid Balance Chart

JANE ANDREWS

1234567

24 Hr. Fluid Balance Chart

1/7/13 LABOUR WARD

TIME	INTAKE (ml)			OUTPUT (ml)				
	Oral / Intra-gastric	Intravenous	Hourly Total	Urine	Vomit / Aspiration	Drainage EBL	Irrig	Hrly Total
0800	Tea water 1000ml			300				
0900								
1000					200			
1100		HARTMANN'S 1000ml		300				
1200								
1300								
1400		HARTMANN'S 1000ml		400				
1500		14 ¹ N/Saline 500ml Synthecan 20ml						
1600					250			
1700				200				
1800		HARTMANN'S 1000ml		160				
1900		Synthecan 40ml @ 12.5ml/hr		10				
12hr Totals	1000ml	4000ml		1370	450	3000ml Blood loss		
2000		HARTMANN'S 1000ml 2 UNITS Blood (600ml)		10				
2100		1 UNIT Blood		20				
2200								
2300								
2400								
0100								
0200								
0300								
0400								
0500								
0600								
0700								
12hr Totals								
24hr Totals								

INTAKE =	OUTPUT =
----------	----------

24 HR. BALANCE =

Scenario two

Objective data: Laboratory results

Name Jane Andrews
Hospital number 1234567
DOB 07/08/78

Date	Pregnancy Reference Range	1/7/13	1/7/13	1/7/13	1/7/13
Time		06.30	19.55	20.45	21.15
Haemoglobin	>10g/dl	10.8	5.3	6.4	7.6
White cells	4-12	5.2	5.8	6.7	6.0
Platelets	>150	196	124	115	116
Haematocrit	0.28-0.40	0.35	0.196	0.210	0.229
INR		1.1	1.4	1.4	1.2
APTT		Normal	Normal	Normal	Normal
Fibrinogen	2.9-6.2g/L	3.30	1.8	1.6	1.50
Haemocue		—	4.9	6.1	7.2
Sodium	136 -145 mmol/L	136	136		135
Potassium	3.5 - 5.2 mmol/L	3.8	3.9		3.9
Chloride	95-107 mmol/L	106	107		104
Bicarbonate	18-26 mmol/L	20	19		21
Urea	2.8-7.6 mmol/L	3.8	3.9		4.0
Creatinine	<85 µ/L 1 st 2 nd trimester <90 µ/L in 3 rd trimester	50	52		54
Urate (uric acid)	Value linked to gestation	0.32	0.35		0.38
Alkaline Phosphatase	38-229 U/L	118	118		119
Alanine aminotransferase (ALT)	6-32 iU/L	10	10		11
Total bilirubin	3-14 µ/L	3	3		3

Scenario two

Objective data: Staffing levels

Correct number of midwives on duty for the maternity unit in question.

All Band 6 midwives with one Band 7 midwife coordinating. One Band 6 midwife off sick.

Workload – high. All but one of the labour rooms are occupied however, anticipated that three women will be transferred home / to the postnatal ward in the next 60 minutes

Story Board Scenario Three

Scenario 3 (Comorbidities / respiratory)

Frame 1

(1.5 minutes)

Patient presentation 15.00

Angela (Peters) has a known cardiac condition (ventricular septal defect – closed but has occasional history of arrhythmias) according to WHO classification of cardiovascular risk she is a I (Successfully repaired lesions)

History of type 2 diabetes
Raised BMI of 48

Admitted with mild chest pain and shortness of breath;
differential diagnosis pulmonary embolus / cardiac event.
Oxygen saturations 88- 90% in air – oxygen prescribed.
Continuous ECG in progress – appears normal.
Bloods - awaiting results.

Midwife 1

This is Angela. She was admitted from home 35 minutes ago with a history of shortness of breath and mild chest pain. She is 32 weeks pregnant with her first baby and was also concerned about reduced fetal movements. She had a ventricular septal defect repaired in infancy and since then has had no problems except for arrhythmias; but she has had no arrhythmias for about a year now. She has type 2 diabetes and reports she has had fluctuating blood glucose levels for the past 2 days. On admission her blood glucose level was within normal limits. Her oxygen saturations were 88- 90% in air on admission and have now come up to 97% with oxygen at 4L/min via the face mask. She has had a wide bore cannula sited and all bloods have been taken including a FBC, G&S, LFT'S Us & Es, clotting screen and cardiac enzymes. I have done a full antenatal check which was normal and Angela's CTG was normal and has been discontinued. She has felt fetal movements since she was admitted.

Midwife 2 Hello Angela, I will be looking after you now. [Angela replies "hello"]. How is your chest pain now?

Angela – it's still there but my breathing feels a bit better now with the oxygen on.

Midwife 2 Please excuse us talking about you Angela – its important I know what we are doing for you. We can have a chat in a moment if that is OK? [Angela nods]

Cardiac / PE scenario

Frame 2

(1.5 minutes)

Midwife 2 (SM) to Midwife 1 (CM) – what are we doing with the ECG now then?

Midwife 1 (CM)

The ECG is to be continued and observed. The obstetric and anaesthetic registrars have reviewed it and they cannot see any abnormalities at the moment. Urgent medical and cardiology reviews have been requested. I am awaiting a prescription for pain relief for Angela which I need to chase up. I am recording Angela's observations every 15 minutes on a MEOWS chart. Her observations and oxygen saturations are all stable with the oxygen in progress. She has had a twelve lead ECG performed and this needs medical review. Her VTE risk assessment is high and she needs the appropriate management prescribing for this. A portable chest x-ray has been booked and the radiographer should be here very soon.

Midwife 2 (SM) to midwife 1 – what is the differential diagnosis then?

Midwife 1 (CM)

PE, which has been explained to Angela, or possibly a cardiac issue, they are not sure at the moment.

Midwife 2 (SM) to midwife 1 and Angela – thank you, so we have several things to follow up Angela. I will start a blood glucose monitoring chart for you and we will get your pain relief arranged. Whilst (states midwife 1's name) is still here writing her notes I will go and update the sister who is coordinating the labour ward this afternoon. I will be back in five minutes.

Angela (KM) – thank you. I am glad I came in as I said to my husband I would be wasting your time.

Midwife 2 (SM) to Angela – it is always best to come in and be checked over so please don't think you are wasting our time. You did the right thing.

End of scenario 3

Scenario three

Objective data: Excerpt from patient notes

Name Angela Peters
Hospital number C5316666
DOB 19/03/86

26/07/13 15.05

Midwife 2, taking over care from midwife 1. Summary of Angela's care to date; Angela admitted from home with a history of shortness of breath and mild chest pain. 32 weeks pregnant, gravida 1, para 0. Concerned about reduced fetal movements on admission.

Medical history:

Ventricular septal defect repaired in infancy and since then, no problems except for arrhythmias; no arrhythmias for about a year now.

Type 2 diabetes with fluctuating blood glucose levels for the past 2 days. On admission blood glucose level was within normal limits.

BMI of 48

Oxygen saturations 88 - 90% in air on admission, now increased to 97% with oxygen prescribed at 4L/min via the face mask (in progress).

Wide bore cannula sited and bloods taken; FBC, G&S, LFT'S Us & Es, clotting screen and cardiac enzymes – awaiting results

Full antenatal examination on admission was normal and CTG normal. Fetal movements felt since admission.

Continuous ECG in progress – reviewed by registrar and appears normal.

Plan:

Awaiting urgent medical and cardiology reviews. Twelve lead ECG has been performed - needs medical review.

Venous thromboembolism (VTE) risk assessment is high and needs to be reviewed by doctor.

Awaiting portable chest x-ray.

MEOWS chart in progress. Observations to be recorded every 15 minutes. Oxygen therapy in progress. Pain relief needs to be chased up.

To update the midwife who is coordinating the labour ward

Objective data: MEOWS (from admission onwards)

Name Angela Peters
Hospital number C5316666
DOB 19/03/86

OBSTETRIC EARLY WARNING CHART. FOR MATERNITY USE ONLY

NAME: ANGELA PETERS DOB: 19/3/86

CHI: C5316666 WARD: LABOUR

CONTACT DOCTOR FOR EARLY INTERVENTION IF PATIENT TRIGGERS ONE RED OR TWO YELLOW SCORES AT ANY ONE TIME

26/7/18 Date: 26/7/18 Time: 15:30

RESP (write rate in correct box)	>30	21-30	11-20	0-10	>30
		24 22	20 20 13 13		

Saturations	90-100%	<90%	90-100%	<90%
	92 97 97 97 97			

O2 Conc.	%	%	%
	Air 44/min → 44%		

Temp	39	38	37	36	35	39	38	37	36	35
			36.6							

HEART RATE	170	160	150	140	130	120	110	100	90	80	70	60	50	40	170	160	150	140	130	120	110	100	90	80	70	60	50	40
							115		112		110		104	102	103													

Systolic blood pressure	200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50	200	190	180	170	160	150	140	130	120	110	100	90	80	70	60	50

Diastolic blood pressure	130	120	110	100	90	80	70	60	50	40	130	120	110	100	90	80	70	60	50	40

Passed Urine	Y or N	Y or N	Y or N
Lochia	Normal	N/A	Normal
Proteinuria	2+	N/A	2+
Liquor	Clear / Pink	N/A	Clear / Pink
NEURO RESPONSE (✓)	Alert	✓	Alert
Pain Score (no.)	3-3	2 (rest)	3-3
Nausea (✓)	YES (✓)	✓	YES (✓)
Looks unwell	YES (✓)	✓	YES (✓)
Looks unwell	NO (✓)	✓	NO (✓)
Total Yellow Scores	3	4	3
Total Red Scores	1	0	1

Staffing levels (Scenario 3)

All Band 6 midwives (except one Band 5 preceptee) on duty with one Band 7 midwife coordinating. No staff off sick. Workload – low - moderate. There are empty rooms, mainly low risk women in labour.

8b Content Validity Index measure for the three scenarios

Scenario one. Please rate how accurate the following items (statements) are in relation to the video clip and objective data you have reviewed:	Not accurate (1)	Somewhat accurate (2)	Quite accurate (3)	Highly accurate (4)
1) The patient's condition is severe				
2) Physiological instability is present				
3) The patient is at risk of clinical deterioration				
4) The patient has a common obstetric complication				
5) The patient's vital signs are being monitored frequently by non-invasive means.				
6) The patient's blood results are clinically plausible.				
7) The patient is receiving medications that are not 'commonly' given on the labour ward (i.e. not given on a daily basis on the labour ward)				
8) The staffing levels and workload are identifiable from the information provided				
9) Overall the scenario is clinically credible				
Scenario two Please rate how accurate the following items (statements) are in relation to the video clip and objective data you have reviewed:				
1) The patient has experienced a major obstetric haemorrhage				
2) The patient is physiologically stable at this point in time				
3) The patient is at risk of clinical deterioration				
4) The patient has experienced a common obstetric complication				
5) The patient's vital signs are being monitored frequently by non-invasive means and invasive monitoring is about to be commenced.				
6) The patient's blood results are clinically plausible.				
7) The patient requires fluid administration via a central line.				
8) The staffing levels and workload are identifiable from the information provided				
9) Overall the scenario is clinically credible				
Scenario three Please rate how accurate the following items (statements) are in relation to the video clip and objective data you have reviewed:	Not accurate 1	Somewhat accurate 2	Quite accurate 3	Highly accurate 4
1) The severity of the patient's condition is currently unknown				
2) The patient is physiologically stable at this time whilst receiving facial oxygen				
3) The patient is at risk of clinical deterioration				
4) The patient has comorbidities (i.e. pre-existing medical conditions)				
5) The patient's vital signs are being monitored frequently by non-invasive means including cardiac monitoring (ECG).				
6) The patient is receiving supplementary oxygen < 50% by face mask				
7) The patient has a differential diagnosis but no definitive diagnosis.				
8) The staffing levels and workload are identifiable from the information provided				
9) Overall the scenario is clinically credible				

Table A8-2 Content Validity Index measure for the three scenarios

Appendix 9

9a Delphi Survey Participant Invitation Letter and Information Sheet

Miss Alison James
Lecturer in Midwifery
University of Plymouth
Room SF27, Peninsula Allied Health Centre
University of Plymouth, Derriford Road
Plymouth, Devon
PL6 8BH
[Insert date]

Dear Colleague

I am a lecturer in midwifery and am currently undertaking a modified Delphi study under the supervision of the University of Plymouth to explore the research question: "What constitutes maternity high dependency care?"

I would like to invite you to participate in this multidisciplinary study and a participant information sheet is enclosed for your perusal which explains what participating in this study will involve.

I would be very grateful if you would complete and return the round one questionnaire overleaf in the Stamped Addressed Envelope provided within two weeks of its receipt where possible. The questionnaire has a code and this is purely to enable me to follow up non responders if required.

As this is a three round process it is estimated the research will take approximately nine months to complete. If you are likely to move jobs in this time I would be very grateful if you could provide a constant point of contact such as an E mail address or mobile telephone number so I may contact you for all three rounds of the study. I have enclosed a contact details slip for this information to be entered onto. Please be assured this slip will be stored separately from the questionnaires and the information you provide will only be known to the researcher. It will be stored in a locked filing cabinet in the researcher's office and destroyed on completion of the study.

If you require any additional information or clarification I will be happy to speak with you. I may be contacted by telephone on: 01752 588836 or E mail: Alison.james@plymouth.ac.uk

Thank you for your co-operation and assistance which is greatly appreciated.

Yours sincerely

Alison James (Postgraduate student / lecturer in midwifery)



What constitutes maternity high dependency care (MHDC)?

Information sheet for experts in MHDC

Maternity High Dependency Care (MHDC) is a vital aspect of maternity care provision and is often mentioned within the literature. As part of my PhD studies I am conducting a modified Delphi study under the supervision of the University of Plymouth to explore the research question: "What constitutes high dependency care in the maternity unit setting?" As you are aware, MHDC is a complex entity and the purpose of this research is to explore the issues arising from the literature and to address the information gaps that currently exist. It is hoped that the results of the study may assist practitioners with the planning and provision of MHDC in the future.

Why you have been chosen as a potential study participant.

As a key member of the maternity care multidisciplinary team you have been selected to participate in this study because of the expertise you possess in your current role. Your expertise may be in relation to maternity services provision, your responsibility for direct patient care or a combination of these. Because of the knowledge and skills, you possess in relation to maternity high dependency care your input into this study will be highly valued. Your name was provided by the Clinical Director / Head of Midwifery for your Trust after the study was granted ethical approval through the NHS Research Ethics Committee. Where more than one name was provided for an expert title e.g. Band six midwives or Specialty Registrars, your name will have been randomly chosen. Participation in the study is voluntary and you will be free to withdraw from the study at any time without offering a reason.

What is a modified Delphi study and what does participation in the study involve?

The Delphi technique is a survey method used by researchers to gain a group consensus about a specified topic area. Group consensus is achieved by sending successive rounds of questionnaires to a panel of experts until agreement is achieved.

This study involves a modified Delphi approach, which means the responses received from all of the study participants are anonymised, collated, analysed and returned to all of the study participants who make up the expert group. In this study, the expert group will consist of a maximum of 154 professionals including midwives, obstetricians and anaesthetists.

Participation in this study will involve the completion of three questionnaires. The administration of each successive questionnaire is termed a 'round'. Participants will initially be asked to complete the round one questionnaire which will consist of two parts. Part A of the round one questionnaire will ask participants to identify the components which constitute maternity high dependency care. Part B consists of a short biographical data sheet that will enable the researcher to provide an accurate overview of the expert group.

On returning the round one questionnaire the responses from each participant will be anonymised, collated and analysed and a list of statements, phrases and words that are felt by the group to constitute MHDC will be identified.

After the data obtained during round one has been analysed, the participants will be sent the round two questionnaire. This questionnaire will ask them to rate on a scale the importance of each component comprising MHDC, as identified by the expert group during round one of the study. Participants will also have the opportunity to revise their views following rounds one and two. It is anticipated that professional consensus on what constitutes MHDC will be achieved following the third round questionnaire.

As with all Delphi studies, the anonymity of individual responses is assured and your name will be known only to the researcher. Confidentiality in relation to your participation and the data you provide is also assured. All direct quotes included in the study write up or published in journal articles or conference presentations will be anonymised. Your opinion is greatly valued and I would be grateful if you could respond to all three rounds of the study. The stages of the study are summarised in the research protocol flowchart.

Timescales

It is estimated that the study will take between nine and twelve months to complete in total. This includes the time required for the data to be analysed after each successive round and the round two and three questionnaires to be written, piloted, distributed and analysed.

Results of the study

The results of the study will be written up and contribute in part towards the researcher's PhD thesis which will be submitted to the University of Plymouth Library. The results may also be published in peer reviewed journals, presented at conference presentations and appear in other publications. Participant confidentiality and anonymity is assured. This study will inform future research which aims to examine MHDC further. If you would like to receive a report on the results of phase one of the study, you will be asked to fill in a sheet with your contact details at the round three questionnaire stage. This information will be kept separate from the round three questionnaire and you will be sent the study report in due course.

Further information.

If you require any further information or clarification you may contact the researcher at any time before or during the study:

Work Address: Alison James (Lecturer in Midwifery), Room SF 27, Peninsula Allied Health Centre, University of Plymouth, Derriford Road, Plymouth, PL6 8BH

Telephone 01752 588836 or 01752 588801 and leave a message

E mail: Alison.James@Plymouth.ac.uk

Thank you for taking the time to read this information sheet.



Research protocol flowchart

9b Focus Group study Participant Invitation letter, Information Sheet and Consent Form



**Room 213
8 Portland Villas
Drake Circus Campus
School of Nursing and Midwifery
Faculty of Health and Human Sciences
Plymouth University
Plymouth
PL4 8AA**

27/11/13

Dear Colleague

I am a lecturer in midwifery and will be commencing a piece of research under the supervision of the Plymouth University to explore the research question; "What factors influence midwives' decisions regarding care escalation?"

I would like to ask you to consider participating in a focus group which will involve the observation of three clinical scenarios comprising a combination of video clips and additional paper copy information (e.g. simulated observation sheets, medical notes) and a subsequent focus group discussion.

I would be very grateful if you would read the information sheet attached. If you agree to be involved in the study, please sign the relevant consent form and return to the researcher by post, or alternatively you may e mail the researcher and return the consent form on the day of the focus group.

If you require any additional information or clarification I will be happy to speak with you. I may be contacted by telephone on: 01752 588836 or E mail: Alison.james@plymouth.ac.uk

Thank you for your time and help which is greatly appreciated.

Yours sincerely

Alison James (Postgraduate student / lecturer in midwifery)

A study exploring the factors that influence midwives' decisions to escalate care using video vignettes.

Participant Information Sheet (Version 2, May 2013)

We would like to invite you to take part in a study examining the factors that influence midwives' decision making in relation to the escalation of care. Escalation of care may be said to occur when a woman's condition requires her to receive a higher level of care during pregnancy, labour and / or the postnatal period. A higher level of care may include the need for either maternity high dependency care (MHDC) or transfer to an intensive care unit (ICU) or other specialist units such as coronary care

We acknowledge that you will have clinical experience of care escalation and would like to hear your views by taking part in a focus group. The focus group will consist of 6 to eight midwives of similar grades. The researcher, Alison James will facilitate the focus group and one of her two PhD supervisors (named at the end of this leaflet) will also be present to take written notes

If you have any further questions please do not hesitate to contact one of the project team listed on the back of this leaflet.

Below are some questions people often ask about research and our answers:

Who has approved this study?

The Local NHS Research and Development Office has reviewed the study and given its ethical approval.

Why have I been chosen to take part?

Band six and seven midwives have been asked to participate. Your participation is voluntary. If more midwives agree to participate than the maximum number required for each focus group, participant names will be picked at random. Your employer / manager will not be informed of who is participating or who declines to take part.

What will taking part involve?

You will be asked to watch three very short video clips of simulated clinical scenarios based on real life situations (vignettes). You will also be given simulated documentation to accompany the video clips e.g. observation charts, medical and midwifery records. The video clips and documentation will act as triggers for a group discussion about care escalation. It is expected that the focus group will last approximately 45-60 minutes.

What if I change my mind?

You can withdraw from the focus group at any time without having to give an explanation. Your employer / manager will not be informed.

Will taking part be of any benefit to me?

Perhaps not directly but your views will be used to help us understand the factors that influence care escalation.

Are there disadvantages to taking part?

We recognise that being involved will take up a little of your time. We will do our best to minimise any inconvenience by ensuring that the group is held in a seminar / meeting room within the maternity unit at a time that is convenient for you. We do not expect anyone to suffer any harm or injury as a result of participating in this project; we do have insurance cover.

Will what I say during the focus group be confidential?

Before the focus group commences the researcher will state that all of the information revealed by those participating *must* remain confidential within the group. The focus group will be digitally recorded with your signed consent and will be transcribed by the researcher, who will not use your name on the transcript or at any point. You will receive your own code which will be the only link to you, and this code will be stored separately on a computer that is secure and accessible only by the researcher. The code will allow us to remove your data from the project if you change your mind after participating.

What will happen to the data generated by the study?

All paper and electronic data will be stored securely; non-electronic data will be stored in a locked filing cabinet in Alison James' University office. Data stored on a computer will be password protected and only accessible by the research team. Individual files and / or discs will be encrypted. All data will be stored by Alison James for a period of ten years after completion of the research in line with regulations stipulated by the researcher's employer and paper copies of data will be shredded when no longer required (Plymouth University, 2013).

What if I have any concerns?

If you think of questions about the project please feel free to contact the research team using the contact details on the back of this leaflet. If you do wish to participate, please sign the consent form enclosed and return to the researcher.

How and where will the results be published?

We plan to publish our results in academic and professional journals, and at conferences. If requested, we will send you the published findings of the research.

Thank you for reading this leaflet and for considering helping with this study**Researcher:**

Alison James
School of Nursing and Midwifery
Plymouth University
alison.james@plymouth.ac.uk
Tel: 01752 588836

Supervisor:

Professor Ruth Endacott
School of Nursing and Midwifery
Plymouth University
ruth.endacott@plymouth.ac.uk
Tel: 01752 584647

Supervisor:

Dr Elizabeth Stenhouse
School of Nursing and Midwifery
Plymouth University
elizabeth.stenhouse@plymouth.ac.uk
Tel: 01752 588877

Clinical Contact:

Senior Midwife

Plymouth University complaints mechanism is available to you if you wish to complain about any way you are approached or treated during this study. Please contact:

Name (Research Ethics Administrator)

Faculty of Health, Education & Society
Floor 5, Rolle Building, Plymouth University, PL4 8AA
name@plymouth.ac.uk
Tel: 01752 585337

CONSENT FORM

Title of Project: A study exploring the factors that influence midwives' decisions to escalate care using video vignettes.

Name of the Researcher: Alison James

Please initial

1. I confirm that I have read and understand the information sheet dated May 2013 version 2 for the above study. I have had opportunity to consider the information, ask question and have had these answered satisfactorily.

☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

☐

3. I understand that the anonymised data collected during the study may be looked at by the research team. I give permission for these individuals to have access to this information.

☐

4. I agree to take part in the above study.

☐

Name of participant (print)
Signature

Date

Name of the researcher (print)
Signature

Date

Appendix 10

Detailed summary of Delphi round one responders and non-responders

Unit	1 st wave questionnaires sent out	1st wave questionnaires returned	2 nd wave questionnaires sent out	2 nd wave questionnaires returned	Total 1st and 2 nd wave questionnaires sent out	Total 1st and 2nd wave questionnaires returned	% Total returns
A	20	10	7	1	27	11	40.7
B	21	12	7	5	28	17	60.7
C	22	10	8	4	30	14	46.6
D	22	11	7	4	29	15	51.7
E	19	5	7	4	26	9	34.6
F	18	9	9	4 (+1 invalid)	27	13 (+1 invalid)	48.1
G	18	4	8	2	26	6 (+ 1 late)	23.1
Total	140	61 (43.6%)	53	24 (45.3%)	193	85	44

Table A10-1 Detailed summary of round one responders and non-responders

Delphi Round one questionnaire return rates according to Professional Title and OU

Obstetric Unit	A	B	C	D	E	F	G	TOTAL all units
Professional title	Number questionnaires returned / number sent out (percentage return rate)							
Band 6 midwife	1/3 33.3%	3/3 100%	2/2 100%	1/3 33.3%	1/4 25%	1/3 33.3%	0/4 0%	9/22 40.9%
Band 7 midwife	0/4 0%	2/2 100%	1/4 25%	1/2 50%	1/4 25%	1/4 25%	2/3 66.6%	8/23 34.8%
Labour Ward Manager	1/1 100%	1/1 100%	0/1 0%	0/1 0%	0/1 0%	1/1 100%	0/1 0%	3/7 42.9%
Head of Midwifery	1/1 100%	0/1 0%	0/1 0%	1/1 100%	0/1 0%	1/1 100%	0/1 0%	3/7 42.8%
Practice Development Midwife	1/1 100%	0/1 0%	0/1 0%	0/1 0%	1/2 50%	1/1 100%	1/1 100%	4/8 50%
Midwifery Risk Manager	1/1 100%	1/1 100%	0/1 0%	1/1 100%	0/1 0%	1/1 100%	0/1 0%	4/7 57.1%
Supervisor of Midwives (included as primary role)	0/4 0%	2/2 100%	3/3 100%	3/4 75%	2/2 100%	1/3 33.3%	2/3 66.6%	13/21 61.9%
Consultant Obstetrician - labour ward lead	1/1 100%	1/1 100%	0/1 0%	1/1 100%	1/1 100%	1/1 100%	0/1 0%	5/7 71.4%
Consultant Obstetrician (not labour ward lead)	1/3 33.3%	0/4 0%	2/2 100%	1/4 25%	1/3 33.3%	2/3 66.6%	0/2 0%	7/21 33.3%
Specialty Registrar in Obstetrics	2/2 100%	2/4 50%	2/4 50%	1/3 33.3%	0/0 NA	2/4 50%	0/0 NA	9/17 52.9%
Staff Grade Doctor (Obstetrics)	0/2 0%	0/1 0%	1/3 33.3%	0/2 0%	1/3 33.3%	0/0 NA	1/3 33.3%	3/14 21.4%
Consultant Anaesthetist responsibility for Obstetrics	1/1 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%	0/2 0%	6/8 75%
Specialty Registrar in Anaesthetics	1/4 25%	2/4 50%	1/3 33.3%	2/3 66.6%	0/1 0%	0/4 0%	0/0 NA	6/19 31.6%
Staff Grade Doctor (anaesthetics)	0/0 NA	2/2 100%	1/3 33.3%	2/2 100%	0/2 0%	0/0 NA	0/4 0%	5/13 38.5%
Total returns	11/27	17/28	14/30	15/29	9/26	13/27	6/26	85/193
Percentage of returned questionnaires	40.7	60.7	46.6	51.7	34.6	48.1	23.1	44

Table A10-2 Round one questionnaire return rates according to professional title and Obstetric Unit

Summary of all MHDC related educational activities reported by the Delphi respondents

Continuing professional development relevant to MHDC	Most recent MHDC relevant training			MHDC relevant training 2			MHDC relevant training 3			Total count
	Obstetrician	Anesthetist	Midwife	Obstetrician	Anesthetist	Midwife	Obstetrician	Anesthetist	Midwife	
	Count	Count	Count	Count	Count	Count	Count	Count	Count	
Advanced life support course	0	1	0	0	0	0	0	1	0	2
Advanced Life Support in Obstetrics (ALSO)	0	0	7	1	0	0	0	0	4	12
Advanced nephrology course	0	0	0	0	0	0	0	1	0	1
Airway management techniques	0	0	0	0	2	0	0	0	0	2
ALERT Course	1	0	2	0	0	3	0	0	0	6
ALS Instructor	0	1	0	0	0	0	0	0	0	1
Cardiac problems in pregnancy	0	0	0	1	0	0	0	0	0	1
40 credit degree level care of the critically ill adult module	0	0	2	0	0	0	0	0	0	2
Cases in obstetric anaesthesia	0	1	0	0	0	0	0	0	0	1
CEMACH study day	0	0	0	0	1	1	0	0	0	2
CTG update	0	0	0	1	0	1	0	0	0	2
Diabetes in pregnancy study day	0	0	0	0	0	1	0	0	1	2
Epidural update	0	0	1	0	0	0	0	0	0	1
Fluid Symposium (RCOA)	0	0	0	0	1	0	0	0	0	1
High dependency care HEI module	0	0	1	0	0	0	0	0	0	1
In house clinical audit	0	0	1	1	0	0	0	0	0	2
In house mandatory training	6	0	7	1	1	0	0	1	0	16
In house training HDU care 4 hours	0	0	0	0	0	1	0	0	2	3
HDU care 1 day training	0	0	2	0	0	0	0	0	1	3
ITU update days	0	1	0	0	0	0	0	0	0	1
Level one critical care course instructor	0	0	0	0	1	0	0	0	0	1
Life support for pregnant women course	1	0	0	0	0	0	1	0	0	2
Major Obstetric Haemorrhage day	1	0	0	0	0	0	1	0	0	2
Managing Obstetric Emergencies and Trauma course (MOET)	2	0	0	0	0	0	0	0	0	2
Masters module high dependency midwifery care	0	0	1	0	0	0	0	0	0	1
Maternal Medicine study day	3	0	0	0	0	0	0	0	0	3
OAA 3 day refresher course	0	1	0	0	2	0	0	0	0	3
Obstetric Anaesthetists Association meeting	0	2	0	0	1	0	0	0	0	3
Obstetric Anaesthesia- cardiac patients	0	0	0	0	0	0	0	1	0	1
Obstetric emergency drills	0	0	2	0	1	3	1	0	1	8
PROMPT study day	0	2	1	2	0	0	0	0	0	5
RCA/OAA critical care on the labour ward lecture	0	1	0	0	0	0	0	0	0	1
RCOG 3 day labour ward update	1	0	0	0	0	0	0	0	0	1
RCOG Advanced Labour Practice Course	1	0	0	0	0	0	0	0	0	1
RCOG International meeting	1	0	0	0	0	0	0	0	0	1
Regional Obstetric emergency course	0	0	0	1	0	0	0	0	0	1
Regional study days by the Deanery	1	0	0	0	0	0	0	0	0	1
SAFE Study Day	0	0	0	0	0	1	0	0	0	1
Transport of the critically ill patient	0	1	0	0	1	0	0	0	0	2
Total count	18	11	27	8	11	11	3	3	9	95

Table A10-3 Summary of MHDC related educational activities reported by the respondents

Detailed breakdown of Delphi round three questionnaire return rates analysed by professional titles and individual OUs

Professional Title (Midwives)	Hospital code (Number of round 3 responders / Number of round 2 responders)							
	A	B	C	D	E	F	G	Total
Band 6 midwife	0/1	3/3	2/2	1/1	0/0	0/0	0/0	6/7
Band 7 midwife	0/0	2/2	1/1	1/1	1/1	0/1	2/2	7/8
Labour Ward Manager	1/1	1/1	0/0	0/0	0/0	1/1	0/0	3/3
Head of Midwifery	0/0	0/0	0/0	1/1	0/0	0/0	0/0	1/1
Practice Development / Education Midwife	1/1	0/0	0/0	0/0	1/1	0/0	1/1	3/3
Midwifery Risk Manager	1/1	1/1	0/0	1/1	0/0	1/1	0/1	4/4
Supervisor of Midwives	0/0	2/2	2/2	3/3	2/2	1/1	1/1	11/11
Total number of midwives	3	9	5	7	4	3	4	35/37
Professional Title (Doctors)	A	B	C	D	E	F	G	Total
Consultant Obstetrician - labour ward lead	0/1	1/1	0/0	1/1	0/0	1/1	0/0	3/4
Consultant Obstetrician (not labour ward lead)	1/1	0/0	1/2	1/1	1/1	2/2	0/0	6/7
Specialty Registrar in Obstetrics and Gynaecology	1/2	2/2	2/2	0/0	0/0	2/2	0/0	7/8
Staff Grade Doctor / Associate Specialist (Obstetrics and Gynaecology)	0/0	0/0	1/1	0/0	1/1	0/0	1/1	3/3
Consultant Anaesthetist with Lead responsibility for Obstetrics	0/0	1/1	1/1	1/1	1/1	1/1	0/0	5/5
Specialty Registrar in Anaesthetics	1/1	1/1	1/1	1/2	0/0	0/0	0/0	4/5
Staff Grade Doctor / Associate Specialist (anaesthetics)	0	1/2	1/1	2/2	0/0	0/0	0/0	4/5
Total number of Doctors	3	6	7	6	3	6	1	32/37
Total number of responses (Doctors and Midwives)	6	15	12	13	7	9	5	67

Table A10-4 Detailed breakdown of round three questionnaire return rates analysed by professional titles and individual OU.

Appendix 11

Transcription of individual questionnaires for the Band six focus group held in maternity unit J

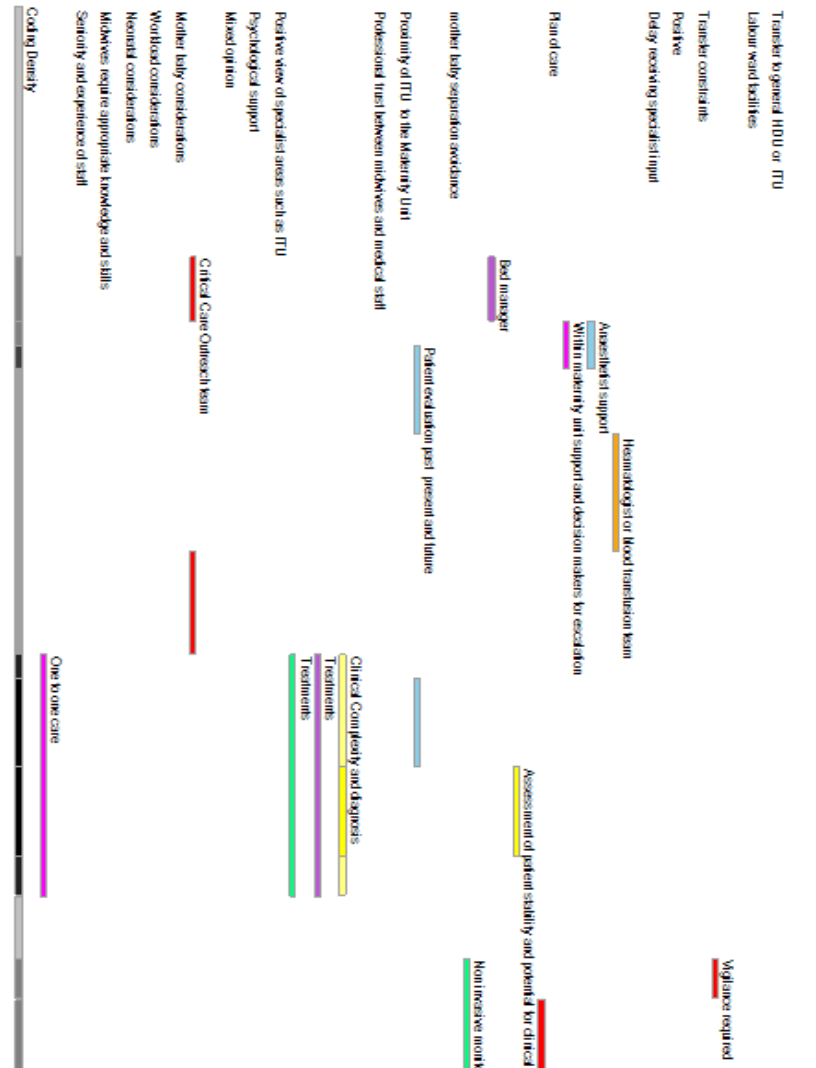
Hospital	Participant	Band	Programme	Years qualified	Critical care training?	S1 What would you do in terms of care escalation?	S1 Why	S2 What would you do in terms of care escalation?	S2 Why	S3 What would you do in terms of care escalation?	S3 Why
J	1	6	Direct	2	No - PROMPT training only	Continue observation management. Continue fluid management, continue medication. Observe headache post analgesia. Observe all other symptoms re PET. ? Bloods to monitor trend. Ensure access (IV). Escalate if numbers increase.	Decrease BP and PET symptoms. Decrease risk of eclamptic fit.	Urgent Consultant review. IV access if struggling / positional. Transfer to HDU ASAP	CVP line	Continue with monitoring. Chase medical and cardiology review ++ Discuss with coordinating MW - to advise and lead me. ? Clexane.	?PE
J	2	6	Shortened	40	Yes - worked in HDU Maternity unit	Remain on Labour ward / HDU. 1:1 Care. 1/2 hourly observations. Review senior drs.	PET. On mag sulph. Drugs!! May need transfer to ITU	Consultant review asap. CVP for decreased urine output. HB 5.0. Blood loss 3000 mls.	CVP - no trained midwives, unable to maintain comp.	Remain labour ward - HDU . 1:1 ???CCU. Coordinator aware of condition. Cont ECG. Cardiac review. Continue maternal monitoring. VQ scan.	Condition unknown.
J	3	6	Shortened	19	No	1. Intensivist involvement telephone. 2. Obstetrician to review antihypertensive therapy now. 3. Stay on LW at present.	Antihypertensives not working yet.	To HDU. CVP being monitored - she would not have been accepted back onto xxxxx Labour ward.	Criteria for HDU admission - CVP monitoring. No midwife competent to use CVP	Obs relatively stable. Critical care outreach to come for support. Question continuous ECG, MW not able to interpret. Urgent cardiac review. Urgent CXR. If PE continue on labour ward .	If considering cardiac problem, and requiring ECG consider transfer to CCU with MW monitoring baby and obstetric review.
J	4	6	Direct	9	No	Remain on Labour ward being specialised on HDU. Continue with MgSO4. Continue observations / reflexes. Continue record keeping. Senior review ? Increase labetalol. Analgesia. Bloods 6 hourly at least. Fluids restricted to 85 mls/hr.	High risk patient - PET	To HDU as CVP line. Would not have back on Labour ward. Urgent senior review.	nothing written	Continue obs, O2. Chase blood results. Senior review with ECG. VQ scan needed. Commence clexane / for ? PE. Analgesia if required.	Critical care team to come and assist. If cardiac - to cardiac ward with daily obs reviews.
J	5	6	Shortened	13	PROMPT	Discuss with consultant haematologist re blood picture. Add another antihypertensive ? Nifedipine as systolic still too high. HDU monitoring to continue on labour ward - no need for main HDU at present.	Platelet trend down. Will she need blood products? Systolic elevated. Keep MgSO4 and IV lab. Going.	Urgent consultant review. Move to HDU . Re site cannula - need x2 access for syntocinon and blood separately. Call consultant and anaesthetist to ensure moved to HDU.	CVP line care - HDU not labour ward. Unsafe for patient to be cared for on labour ward . Midwifery skills not up to providing her with safe care.	1. Cardiology to review ECG. 2. Obstetrician review for commencing clexane. Arrange VQ after chest XRAY.	1. Exclude cardiac cause then can treat as PE until proven otherwise. 2. Need to start clexane now, prophylactically.
J	6	6	Shortened	29	No	not present for first scenario	not present for first scenario	Consultant review stat. Prompt transfer to HDU - CVP line to be managed.	Staff on labour ward not trained to manage CVP line. Ill patient - Hb 5g/dl, poor urine output.	Haematology input ASAP. D dimer. Diabetic review. High risk pregnancy / cardiology review. Clexane / VQ scan.	Complex needs ECG ? CCU

Table A11-1 Example of transcribed individual questionnaires (Band 6 / Unit J)

(S1, S2 and S3 refer to scenarios one, two and three)

Appendix 12

Coding of a focus group (study phase two) using NVivo coding stripes



UNIT H 13/01/14

Band 7 Focus group

Scenario 1

(6 minutes 51 seconds)

AJ: As band 7's then in your role, with this scenario, in terms of your care escalation what would you want to be doing with this lady and why? That's our debate for the next ten minutes or so.

P1: I'd inform outreach, using outreach and the bed manager just in case we need an ITU bed.

P2: I think that what hasn't happened so far from the scenario is anaesthetic input because we haven't had a joint review there just so obstetric consultants come. I'd like the obstetric consultants to review the blood results completely because the platelets are dropping.

P3: I would like a haematologist involved.

AJ: So would you be bleeping them as the coordinators?

P1: Yeah or liaise with the consultant to do that.

P4: Outreach are pretty good here I don't know about elsewhere but if we involve outreach, they do a lot of liaising for us on our behalf and help out.

P2: Yeah, they're really good.

P3: I'm gonna make sure that lady has one to one care, so her midwife is not needed elsewhere and she hasn't responded as yet to the Labetalol, her blood pressure is still the same so we could look at what other anti-hypertensive she could have but you've got to be cautious in case it crashes.

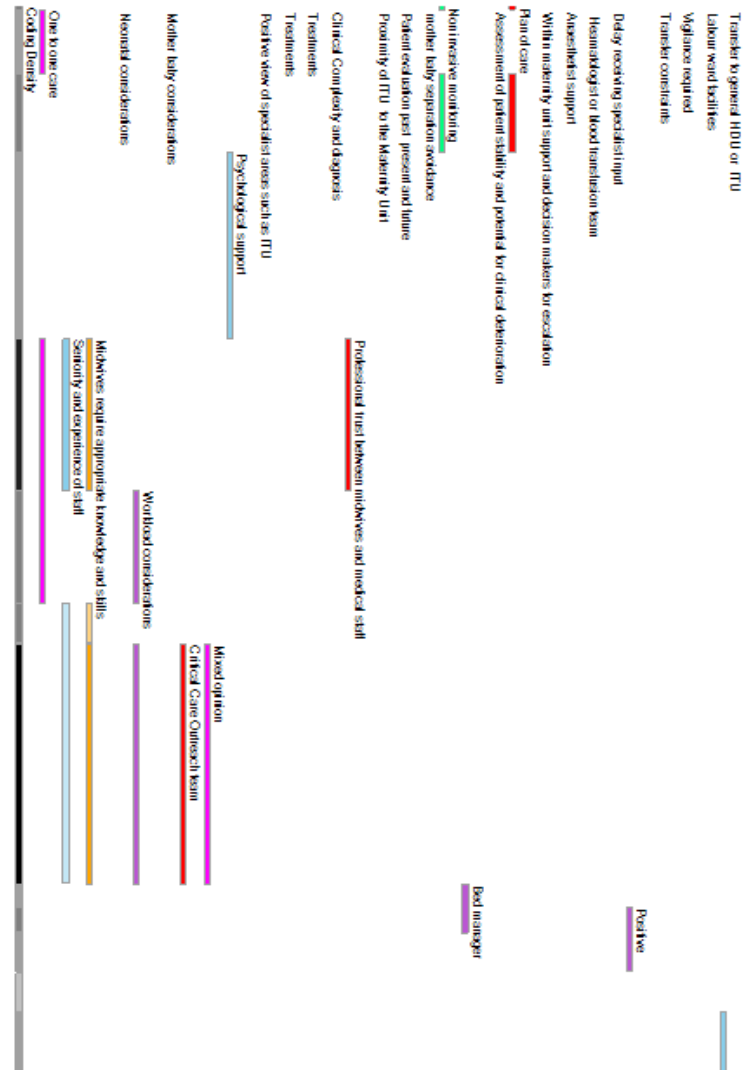
P1: But equally we know that that there is an increased risk of intracranial haemorrhage if you don't get their blood pressure down particularly if she's complaining about a frontal headache.

P3: Yeah, that's right.

AJ: What does everybody else think about that? Is there anything else you'd want to do?

P5: Just make sure the reflexes are done hourly because of the mag sulph toxicity.

P6: But there's a very succinct plan of what's expected of everybody observation wise.



P6: One to one with the lady so that you're there so that you can see their subtle changes and react quickly.

P4: Strict fluid balance management.

P2: She's on hourly urinary measurements already isn't she?

P6: And then looking more holistically as well, this lady is a para 1, so she's previous, we haven't got the notes we don't know exactly what happened first time round but, this must be *shocking for her* if this didn't happen in her first pregnancy it's all very very different, so she needs some sort of psychological support as well and I'd wanna make sure that she's got her photo from special care as baby has gone off to special care, and information given for the woman and her next of kin and consent for anything we do.

AJ: So in this unit would you be saying to the consultant I'm happy to keep this lady here, or would it be up to outreach to make the decision as to where she... goes

P3: I think it's a bit of both, which is the safest area; if we've got somebody that can special her with the right experience, because it depends on the right experience in your house; if you've got very junior staff you might not do it.

P6: And the rest of your workload on labour ward, you'd have to consider that you're not actually taking your midwife out of that room because when you've got someone who is needing that much care then you can't have her dipping in out can you, you've got to have that focus.

P5: and experienced staff looking after her.

P1: The workload is moderate and the women are all in labour so yeah, I mean if you've got an appropriate midwife, appropriately skilled and experienced midwife looking after her and you've got the support from outreach *I think* she could probably stay on labour ward but I'd have to think about it.

P5: Debate re sending her to ITU. I would have sent her off. Send her to ITU. It depends.

P4: I would want her stabilising and then have her back when she was stable rather than, because she's not stable is she at all, by any means.

P2: And that's why I put inform the bed manager, for that reason, because you don't always have a bed available immediately, but if they know you might need one they are quite good at getting you one as soon as they can.

AJ: Oh I see yeah. That's interesting; some of you might have done differently

P3: I'd have wanted her off

Appendix 13

Overarching framework matrix displaying all Focus Group study themes, categories and subcategories

Theme	Category	Codes (subcategories)
Maternal wellbeing	Clinical complexity	Diagnosis Stability / potential for deterioration – objective and intuitive Risk status
	Mother / baby considerations	Fetal / neonatal considerations Mother baby separation Maternal support
	Patient evaluation	Past Present Predicted
Care plan	Vigilance	Staff to patient ratio (one to one care) Level of monitoring Noninvasive monitoring Invasive monitoring Investigations
	Interventions	Treatments Referral to guidelines Intervention level (ICS levels of care)
influences	Staffing and Workload	Staffing levels Skill mix Workload
	Multidisciplinary team working and support	Internal supporters (OU staff) External supporters (staff based outside of the OU)
Fixed Variable influences	Environment	Location of maternity unit in relation to specialist areas such as ITU Facilities and equipment
	Midwifery accountability	Level of expertise / acknowledging limitations Maintaining competencies
Obstacles	Obstacles to care escalation	'Pregnancy' Lack of understanding re midwifery role Challenges to accountability Negative professional relationships Delays receiving internal / external support Limited bed availability (on specialist units)

Table A13-0 The themes, categories and subcategories comprising the framework matrix.

Excerpts from the framework matrices

Obstetric Unit	Theme: Care plan Category: Vigilance Code: Level of monitoring		
	Scenario one	Scenario two	Scenario three
	<p>What would you do in terms of care escalation? 5 mins observations. Hourly urine output. Be prepared for eclampsia episode. Immediate consultant review with a view to transfer to HDU (? HELLP) Inform coordinator. Inform anaesthetist (ID/Band 6/ P1)</p>	<p>What would you do in terms of care escalation? Needs 2 grey cannulas. Clotting studies?? FFP. Hourly urometer. Obs 1/4 hourly. Bair hugger. Weigh and measure continuing blood loss. MOH protocol. OUTREACH - bed manager etc, incident forms. (ID/Band 7/P4)</p>	<p>What would you do in terms of care escalation? Inform coordinator. 15 mins obs. Reg RV - VQ scan -? PE.? treatment dose LMWH.? Transfer to medical ward (ID/Band 7/ P1)</p>
	<p>What would you do in terms of care escalation? Anaesthetic review. With 5 min obs think should be reviewed for ITU / high dependency. How many women are in labour for 1:1 care. BP stable Why? Not adequately trained. Better intensive care trained - exposure to support. (ID/Band 6 / P4)</p>	<p>What would you do in terms of care escalation? Needs HDU care level 2. Nurse / MW - experience of CVP lines. Needs close monitoring however, MEOWs within normal range. Stable at present. On third unit of blood. EBL improving. Why? May become unstable again. (ID/Band 7/ P3)</p>	<p><i>No data relating to the level of monitoring. Debate focused on the need for continuous ECG and midwives' abilities to interpret these (Memo)</i></p>
	<p>What would you do in terms of care escalation? Continue 15 min observations. Repeat Bloods, Liaise with ITU/ anaesthetists Why? Blood pressure worsening. Risk of HELLP syndrome. (ID/Band 7/P2)</p>	<p>What would you do in terms of care escalation? Moved to labour ward HDU room. Closer monitoring by obstetric / midwifery / anaesthetic staff. (ID/Band 7/P5)</p>	<p>What would you do in terms of care escalation? Continue with monitoring. Chase medical and cardiology review ++ Discuss with coordinating MW - to advise and lead me.? Clexane. (ID / Band 6 / P1)</p>

Table A13-1 Excerpts from the framework matrix for the category of vigilance and subcategory level of monitoring

Theme: Care plan Category: Vigilance Code: Invasive monitoring				
Unit J	Band 6	Individual data What would you do in terms of care escalation?	Why?	Focus group data extracts / researcher memos
		P1: Urgent Consultant review. IV access if struggling / positional. Transfer to general HDU ASAP	CVP line	<p>P3: "She would be off the labour ward. She wouldn't have come back to the labour ward because our criteria for admission to HDU is if she is having CVP monitoring. In (name of unit) we haven't got one single midwife who is competent to use a CVP and we have got an arrangement with [mentions 2 names] (who is the HDU matron, critical care matron) that if they need art or CVP monitoring they should be going straight to [general] HDU. But for anybody who requires routine monitoring, not one midwife here is trained and competent because we can't maintain the competency". (FG)</p> <p><i>All Band six midwives are in agreement that in scenario two, the woman's care will be escalated to the general hospital HDU. Midwives will only care for a woman with a CVP line if it is for venous access and the woman has no other complications (Memo).</i></p>
		P2: Consultant review asap. CVP for decreased urine output. HB 5.0. Blood loss 3000 mls	CVP - no trained midwives, unable to maintain comp	
		P3: To HDU . CVP being monitored - she would not have been accepted back onto (name of) Labour ward.	Criteria for HDU admission - CVP monitoring. No midwife competent to use CVP	
		P4: To HDU as CVP line . Would not have back on Labour ward. Urgent senior review	Nothing written	
		P5: Urgent consultant review. Move to HDU . Re site cannula - need x2 access for syntocinon and blood separately. Call consultant and anesthetist to ensure moved to HDU	CVP line care – [General] HDU (not labour ward HDU) . Unsafe for patient to be cared for on labour ward. Midwifery skills not up to providing her with safe care.	
		P6: Consultant review stat. Prompt transfer to HDU - CVP line to be managed	Staff on labour ward not trained to manage CVP line. Ill patient - Hb 5g/dl, poor urine output.	

Table A13-2 Excerpts from the framework matrix for Unit J, Band 6 midwives, Scenario two (invasive monitoring code).

Theme: Care plan Category: Vigilance Code: Invasive monitoring				
Unit J	Band 7	Individual data What would you do in terms of care escalation?	Why?	Focus group data extracts / researcher memos
		P1: Remain in HDU room on Labour ward. Involve critical care team so aware and for CVP line input as not trained. Multidisciplinary approach. Observe for improving picture. Ensure consultant aware if not already.	Stable now	AJ: Do you all have training for CVPs then? P4: Some people do and some people don't
		P2: If requires CVP readings needs transfer. New IV cannula for blood transfusion / synto. Could stay on Labour ward if no CVP required for period before transfer.	Do not undertake CVP on labour ward Cannula sore and? Tissued.	P3: Most of the Bands 7s have had the competency training, but it's maintaining that competency because we don't see them very often. It's really easy to lose your skills so at the moment we get support from the Acute Care team
		P3: Stay on Labour ward HDU - condition now stable BUT: Needs 1:1 to ensure pv loss / uterus does not change. Care by senior staff, including obs, anaesthetist, haematologist and MW. Staffing. Care from outreach etc re CVP (Acute care team).	Possibility of increased risk of further bleeds.	P5: So if we had a lady who had a CVAD and we didn't feel we could manage it because theatres were busy, they would come down and help us with that. (Name) was just talking about that before you came in actually. they would come down and do a bit of on the spot training with the midwife looking after the patient (FG)
		P4: Keep on Labour ward HDU. Seems stable, well resuscitated, Hb increasing. CVP Can be managed - anaesthetist and critical care for support as required.	Deal with PPHs regularly.	The majority of midwives in Unit J in the Band 7 focus group elected to keep the woman on the labour ward and enlist support from theatres / the acute care team or the Anaesthetist. Only two of the midwives stated they would transfer the woman off the labour ward as a direct result of the CVP line being in situ. The issue of midwives not being able to maintain their competency levels when caring for women with invasive monitoring was raised. There were clear differences of opinion in terms of the Band six midwives and the Band seven midwives escalation of care decisions for this scenario in Unit J. (Memo)
		P5: Moved to Labour ward HDU room. Closer monitoring by obstetric / midwifery / anaesthetic staff.	Stable observations.	
		P6: Call critical care team for advice re care of CVP line. Ensure venflon access with team. To stay on HDU on Labour ward.	To enable her to be supported to stay with baby but ensure adequate staff to provide care.	
		P7: Transfer to ICU - off the del suite. Re: current obs, need for CVP line, use of CVP line, staffing.	CVP line not managed on MW HDU. Blood transfusion via CVP line. Blood should be measured and pads weighed etc.	
		P8: Remain on HDU with 1:1 care (Labour ward). Has to be someone who can care for CVP lines (not all MW nurse trained). Skill mix. The patient now appears stable however, I would need to consider workload and staffing numbers. I would D/W Consultant and anaesthetist. Low threshold to transfer if pt. becomes unstable. I would also consider escalation policy for staffing (unit co-ordinator, supervisor).	Nothing written	
		P9: Remain on labour ward. HDU level 1. Needs 1:1 care. Anaesthetist support with CVAD.	Still bleeding - not resolved. Dropping HB.	

Table A13-3 Excerpts from the framework matrix for Unit J, Band 7 midwives, Scenario two (invasive monitoring code).

Theme: Care plan Category: Vigilance Code: Invasive monitoring				
Unit 1	Band 7	Individual data What would you do in terms of care escalation?	Why?	Focus group data extracts / researcher memos
		P1: 1. 1 to 1 level 2 HDU care on Delivery Suite with a competent midwife. 2. strict fluid input / output chart. 3. Senior obs / anaesthetist review / haematologist. 4.? Needs further bloods repeating at some point. 5. A blood loss that large would normally be kept under GA and go to ITU.	1. In case of further collapse, or further haemorrhage. Better having a midwife providing the care rather than the RGN due to needing to palpate uterus and assessment of lochia. 2. Currently output is low and concentrated. 3.? Needs more fluids / Hb is very low.	AJ: With this scenario what would you want to do with this lady in terms of care escalation and why? P1: You'd still want an experienced midwife in there, particularly one that's experienced in the use of the CVP line, who wasn't intimidated by it. If she -- we don't have many CVP lines so you might actually benefit from having an anaesthetist going through the use of the CVP lines and particular things that you would be watching for. So that everybody just feels comfortable with it. AJ: Okay, thank you, (name). P1: Can I add to that? AJ: Go on. P1: I'd want a midwife in there rather than an RGN because we want to keep her on re palpating her uterus P2: Absolutely agree. P3: and an RGN, (pauses) and the nurses are not able to do that. (FG)
		P2: Physical review by coordinator. Requires one to one care - review by reg / anaesthetist / co-ordinator - multidisciplinary. Is bleeding controlled / lochia moderate, move and roll. Make sure enough staff / confident with CVP line. VTE / pressure areas. Correct room / PPH trolley. ? misoprostol / tranexamic acid. Needs balance calculated - in increasing positive balance.	Dropping fibrinogen / bruising / ? DIC - haemodilutional effect. Ensure controlled, not to lose anymore (would have EUA). ? Declared major obstetric haemorrhage?	P1: Normally they would have been put to sleep during the blood loss and that's where they wouldn't wake them up, they'd keep them asleep and they'd want to transfer her to ITU. P2: But normally it's, it'll be rare for a big blood loss like that still to be on Delivery Suite, they wouldn't get woken up they'd be kept under GA P4: Then they'd go straight over [to ITU] from theatre. (FG)
		P3: Needs HDU care level 2. Nurse / MW - experience of CVP lines. Needs close monitoring however, MEOs within normal range. Stable at present. On third unit of blood. EBL improving.	May become unstable again.	<i>This focus group included a debate on the 'usual' management of a woman in this situation which was described as 'transfer to the ICU after having an Examination Under General Anaesthetic' which was in their labour ward guidelines (Memo)</i>
		P4: Maintain HDU level. Senior level midwifery care. Continue observations / MEOs. Multidisciplinary approach. Monitor loss - medical / obstetric input. Observe bleeding areas i.e. cannula sites. Close observation maintained, fluid balance. Documentation.	3000mls PPH (severe). Interesting that our threshold for severe has raised. 1500 mls was severe at some stage.	<i>The midwives in this OU were aware of the ICS levels of care as they had an audit in progress regarding women receiving MHDC (Memo)</i>
		P5: Would you use misoprostol? Earlier review than 22.00. Syntocinon infusion may be on-going - another cannula. Haemacue. Xmatch What is her blood loss now? Debriefing by consultant or reg. Catheter - may need flushing / fluid challenge. Bakri Balloon? PPH trolley in room. 1:1 care level 2	Ensure she does not deteriorate. Ensure that the CVP is accurately read.	

Table A13-4 Excerpts from the framework matrix for Unit I, Band 7 midwives, scenario two (invasive monitoring code)

Theme: Care plan Category: Vigilance Code: Invasive monitoring				
Unit 1	Band 6	Individual data What would you do in terms of care escalation?	Why?	Focus group data extracts / researcher memos
		P1: Continue care on Delivery Suite, preferably with the help from an experienced nurse.	Many aspects normalizing. Mum still has baby with her. On suite. When units complete., normal urine may occur.	P3: I have absolutely no idea how to care for a CVP line. P1: No, I wouldn't bother about caring for her where I am, as long as I had someone with me who could deal with the bits that I have no experience of dealing with
		P2: Concerns EBL 3000MLS, difficult peripheral cannulation, urine output 20mls/ hour. Unstable blood picture. Very high risk, plus risk of further PPH. DIC. HDU / ICU (intensive care unit)	Haematocrit and fibrinogen. ? Developing DIC. Risk of further bleed. High workload - all rooms occupied. Cover is a huge concern - anaesthetist /consultant obstetrician.	P3: See I think if a woman needs a CVP line, then I'm not trained to do that so at the moment, apart from the fact that she might well go and that she's got a reduced urine output which I would be quite concerned about if that continues, but she's quite stable apart from that, but to me the CVP line and the readings I wouldn't have a clue, so I'd have to say I'd have to admit my limitations and according to my NMC code of conduct I'm allowed to do that. (FG)
		P3: To ICU	Renal function deteriorating. Fluid overload.	P4:..keep .on the suite for now... P3: With a CVP line? P1: ...she's still got a baby to look after. If I had, and I made a caveat, if I had someone who could look after the CVP line and we do have Band 5 nurses who've probably looked after CVP lines and arterial lines P3: But again, again... P2: What if we for that shift, we haven't got one. P3: Yeah P2: It doesn't say P1: It does, it says midwives available P3: But again we're assuming, we're putting too much on those Band 5 nurses that they might not feel adequately trained, they're Band 5 nurses; where have they come from, some have just come from (name of a ward) and haven't done any ITU training at all. (FG)
		P4: CVP line. 3rd unit of blood. 15 mins obs. 1 hourly CVP measurements. Careful reviews by anaesthetist / obstetrician. HB up. Platelets down	Apart from CVP line I would be happy to keep on DS as stable. Monitor urine, if continues to drop, highly likely to have DIC. Workload high but with what? 3PN ladies - low risk? Still needs 1:1 care.	 <

Table A13-5 Excerpts from the framework matrix for Unit I, Band 6 midwives, scenario two (invasive monitoring code).

		Category: Workload and staffing Code: Skill mix		
		Scenario one	Scenario two	Scenario three
Maternity Unit	H	<p>AJ: So in this unit would you be saying to the consultant I'm happy to keep this lady here, or would it be up to outreach to make the decision as to where she...goes</p> <p>P1: I think it's a bit of both, which is the safest area; if we've got somebody that can special her with the right experience, because it depends on the right experience in your house; if you've got very junior staff you might not do it. (FG / Band 7)</p>	<p>What would you do in terms of care escalation? Senior MW and Reg / Consultant. CVP line to HDU. High risk care not for us. Over 1.5 litres MOHP Why? High risk care (ID/Band 6/ P3)</p> <p>Less data for this code as the midwives were unanimous in the fact the woman's care would be escalated. Senior midwives and osbtetricians were key decision makers (Memo)</p>	<p>What would you do in terms of care escalation? Senior midwife care / review. Obstetrically Well - medical ward. One to one specialist care. Why? ? PE - to medical ward. (ID/Band 6/ P3)</p>
	I	<p>What would you do in terms of care escalation? Experienced midwife caring for her. May need another nurse in the room Medical review Plan 5 minutely obs Level 2 to 3, review and plan (ID/ Band 7 / P5)</p>	<p>What would you do in terms of care escalation? Maintain HDU level. Senior level midwifery care. Continue observations / MEOWS. Multidisciplinary approach. Monitor loss - medical / obstetric input. Observe bleeding areas i.e. cannula sites. Close observation maintained, fluid balance. Documentation. (ID/Band 7/ P4)</p>	<p>P3: Okay I would still want midwifery input at a senior level. P1: But also one that can read ECG's, there isn't a lot of point in having an ECG up if somebody isn't familiar with reading it. (FG/ Band 7)</p>
	J	<p>P6: I must say my experience is not as much as these lovely ladies, I would be petrified and I would want to be led, quite <i>clearly</i> by a senior team. (FG/ Band 6)</p>	<p>AJ: Do certain midwives do the high dependency and certain midwives don't? [All talking together] , P: We just get allocated. P4: You've always got your coordinator to ask for help. But actually you all need to be able to do it. AJ: So actually anyone could be asked to do it? Ps: Yes, yes, P1: It's not the most junior of midwives in there but P4: No but equally, if its... P2: If you've not got many people on the.. P3: If its nicely staffed I'd be going can I help? P5: Yes if there's not many people in then the coordinator might put a more junior member of staff in with an equally more senior one who can support them because at the end the day, if you're not exposed to it, you'll never learn to do it. (FG/Band 6)</p>	<p>P2: We have had women with big PEs that we've kept but it's sort of not what's wrong with her but its what they want us to do and what our skills and knowledge is. If they wanted cardiac monitoring that's outside our sphere of knowledge and she would have to move to another area, or they would provide somebody with the skills and knowledge (FG/ Band 6)</p>

Table A13-6 Excerpts from the framework matrix for the 'skill mix' code

Appendix 14

Publications / Presentations

Publications (Paper)

James, A., Endacott, R. & Stenhouse, E. (2011) 'Identifying women requiring maternity high dependency care'. *Midwifery*, 27 (1), pp. 60-66 DOI: <https://doi.org/10.1016/j.midw.2009.09.001> [Online]. Available at: <http://www.sciencedirect.com/science/article/pii/S0266613809001181>

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Identifying women requiring maternity high dependency care

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ABSTRACT

The prompt identification of clinical deterioration and referral for appropriate care are key issues in the management of women who become critically ill during pregnancy, labour and the postpartum period. The Intensive Care Society has developed designated levels of care in relation to adult patient care, which may not be appropriate for use in midwifery. Therefore, exploring the midwifery, nursing and medical literature related to levels of care and detection of clinical deterioration may highlight the need for these to be modified and adapted for the development of midwifery-specific levels of care that are appropriate for this cohort.

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Introduction

When considering the needs of a woman who becomes critically ill during labour, or during the antenatal or postnatal period, two key issues emerge. Firstly, there must be prompt identification of clinical deterioration by the professionals providing the woman's care, and secondly appropriate care, including referral to specialists, must be initiated in a timely manner (Lewis, 2004, 2007). Whilst some women may never recover from an episode of critical illness (Commission for Healthcare Audit and Inspection, 2006; Lewis, 2007), another group of women will survive and be described as having suffered 'severe maternal morbidity' or 'a near miss' as described by Baskett and O'Connell (2005). Finally, some women will be discharged home from hospital having experienced complications that fall outside of the parameters for severe maternal morbidity or a near miss, but having required what has been termed 'special nursing care' (Yeadon et al., 2001) or high dependency care (Cordingley and Rubin, 1997; Ryan et al., 2000). Within the context of midwifery, the use of track and trigger systems in the detection of clinical deterioration and care delivery in the form of high dependency or intensive care has received limited attention. However, in the nursing literature, these concepts in relation to adult patient care have been debated at length (e.g. Johnstone et al., 2007), and often include reference to the levels of care designated by the Intensive Care Society (2002). These levels of

care may be appropriate for use in midwifery but with modification and adaptation to this very specific cohort.

Given the increasing focus on severe maternal morbidity and near misses (Lewis, 2007), this paper aims to examine the tools and training that are available for midwives to assist them in detecting maternal clinical deterioration promptly. The concept of maternity high dependency care will be explored in conjunction with the Intensive Care Society's levels of critical care for adult patients (Intensive Care Society, 2002, 2009) and directions for future research will be highlighted.

Severe maternal morbidity and near misses

The concepts of severe maternal morbidity and near miss are complex given the varying definitions which exist for each and the interchangeable manner in which they are used (Minkauskiene et al., 2004; Pollock et al., 2008). Maternal admission to intensive care units has been identified as the sole marker for severe maternal morbidity in some instances (Baskett and O'Connell, 2005; Baskett, 2008). Developing this further, 14 categories have been derived to comprise severe maternal morbidity for the purpose of audit in Scotland, and include the categories of blood loss greater or equal to 2500 ml, eclampsia, anaesthetic complications, organ dysfunction and admission to an intensive care or coronary care unit (Penney and Adamson, 2005). In South Africa, strict protocols have been developed to guide routine evaluation of all organ systems and subsequent management of organ failure (Lombaard et al., 2005).

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A near miss has been defined by Mantel et al. (1998) as 'an acute organ system dysfunction which, if not treated appropriately, could result in death', whilst Bewley and Creighton (1997) have proposed two potential definitions: 'a mishap that may or may not have had a poor outcome' and 'a life-threatening episode, where substandard care may or may not be identified'. A large prospective observational study undertaken in Scotland with over 50,000 participants has reported a severe maternal morbidity rate of 3.83 cases per 1000 deliveries (Brace et al., 2004). Given that, of all health indicators, maternal mortality shows the highest discrepancy between developed and less developed countries (Kilpatrick et al., 2002), it is not surprising that rates of severe maternal morbidity differ widely, with the World Health Organization suggesting that at least 15% of pregnant women develop severe morbidities that require medical care in order to avoid maternal death (United Nations Children's Fund, 1997). However, the European Mothers Mortality and Severe Morbidity survey found that countries with the highest incidence of maternal morbidity were not necessarily those with the highest rates of maternal mortality (Zhang et al., 2005). Rates of severe maternal morbidity and near miss will also differ depending on the definitions and criteria used, the accuracy of the data collection, methods of data capture and the characteristics of the populations being studied (Fortney and Smith, 1999; Baskett, 2008). Differences have been identified in rates of severe maternal morbidity and near miss between ethnic groups in the UK (Knight et al., 2009) and the USA (Saftlas et al., 2000). However, in some countries, systems preceding hospital admission also require attention; a cross-sectional study in four hospitals in Indonesia identified that 70% of women classified as 'near miss' in public hospitals were already in a critical state when admitted to hospital (Adisasmita et al., 2008). Factors such as community infrastructure have also been demonstrated to have an impact on maternal health in Bangladesh (Gill and Ahmed, 2004) and Thailand (Sharma and Vong-Ek, 2009).

It could be argued that definitions of morbidity and near miss have the potential to highlight negative aspects of the quality of clinical care provided, although in many cases, clinical deterioration may have been identified at an early stage and the appropriate care and treatment given to a high standard, thereby avoiding fatalities (Lewis, 2007). A study in Chicago examining preventable severe morbidity or mortality identified that women who experienced a near miss were more than four times as likely to have encountered 'provider-related' factors; for example, incomplete or inappropriate management (Geller et al., 2004).

Detecting clinical deterioration

The partogram has been designed as a tool to monitor not only the progress of labour but to record maternal and fetal well-being during the intrapartum period (World Health Organization, 1989; Lavender et al., 1999; Bosse et al., 2002; Fatusi et al., 2008). The physiological maternal parameters of pulse, blood pressure, temperature and urine output may be recorded on a partogram that needs to be completed accurately and in its entirety to monitor well-being (Lavender et al., 2008). In Tanzania, Bosse et al. (2002) reviewed 196 completed partograms and concluded that where poor quality monitoring and recording of fetal and maternal parameters of well-being occurred, unsatisfactory maternal and fetal outcomes were statistically more likely to occur. A recent study undertaken by Nyamtema et al. (2008) examined the quality of partogram completion, and identified that maternal physiological variables were, at times, omitted or documented in a substandard manner. They identified the need for further education, training and audit of partogram

documentation. Whilst the partogram is a tool that is readily available to the majority of midwives and may assist in the pictorial detection of maternal physiological deterioration, it requires accurate and comprehensive completion in order to be effective. It has also been identified that the respiratory rate, a vital physiological variable when assessing the clinical stability of a woman, is not routinely recorded on all partograms and is an issue that needs addressing (Lewis, 2007; Lavender et al., 2008).

The use of early warning scores, also termed 'track and trigger' systems, has been advocated to assist professionals in recognising and managing patient deterioration promptly (Lewis, 2007; National Institute for Health and Clinical Excellence, 2007). The underpinning principle of track and trigger systems is the assigning of scores to clinical observations which can be routinely recorded in the ward environment, including the labour ward. Scores rise as deviations away from normal physiological parameters occur, and predetermined scores act as the trigger for professionals to initiate the appropriate referral and treatment (Goldhill et al., 2005; Smith and Oakey, 2006). Numerous track and trigger systems exist, including single parameter, which utilise the scoring of one physiological parameter such as systolic blood pressure to trigger a response from clinicians (Smith et al., 2008), and aggregate weighted scoring systems. Aggregate scoring systems, such as the modified early warning score, involve the recording and scoring of five or six physiological parameters, including systolic blood pressure, heart rate, respiratory rate, temperature, level of consciousness and, in some instances, urine output (Stenhouse et al., 2000; Subbe et al., 2001, 2006; Gao et al., 2007; Hudson and Boyd, 2007).

The detection of clinical deterioration during pregnancy is complicated by the complex physiological changes that begin shortly after conception and continue throughout pregnancy (Mandeville and Troiano, 1999). A pregnant woman may lose approximately one-third of her circulating blood volume at term before manifesting signs of hypovolaemia (Johanson et al., 2003), due largely to the increases in red blood cell and plasma volumes (Blackburn and Loper, 1992). Complex haemodynamic changes also occur following birth, with cardiac output only returning to non-pregnant values between two and four weeks post partum (Blackburn and Loper, 1992). To compensate for the altered physiology of pregnancy, track and trigger systems may require modification for use during the antenatal and intrapartum periods, and it has been recommended by Lewis (2007) that modified early obstetric warning systems (MEOWS) are used for all acute obstetric admissions.

Whilst Lewis (2007) does not provide a specific definition for the term 'acute obstetric admission', it is suggested that this term encompasses women admitted to a maternity unit for an actual or suspected complication that may either be obstetric in origin (example severe pre eclampsia) or associated with a pre-existing medical or surgical condition. Alternatively, some women may be admitted as they have deviated from 'normal' but have no immediate diagnosis. Admission may be required at any point from early pregnancy until the end of the postnatal period (Lewis, 2007). To date, there are limited data related to the number of maternity units in England that have implemented MEOWS scoring for all acute obstetric admissions.

The literature highlights concerns that track and trigger systems have been developed and implemented without rigorous evaluation of their effectiveness through research and statistical analysis, and therefore the overall accuracy of these systems could be challenged (Johnstone et al., 2007; Cuthbertson, 2008). It has also been emphasised that, in order for any track and trigger system to work effectively, the correct clinical observations must be recorded accurately and at the appropriate frequency, and the track and trigger scores must be calculated correctly

(Goldhill, 2006; Smith and Oakey, 2006). To reduce calculation errors, the use of computers to determine a patient's early warning scores by the bedside has been suggested as a viable option, and provides an electronic alert system when abnormal early warning scores are computed (Smith et al., 2006).

It has been suggested that track and trigger systems cannot replace the need for clinical judgement, but may enhance the referral process between midwives and doctors by providing an objective and unambiguous means of communicating the presence of clinical deterioration facilitating timely referral to those with the relevant expertise (Andrews and Waterman, 2005; Gao et al., 2007). This purported benefit would appear to be echoed in the reduction in preventable complications of hypertension demonstrated following introduction of a strict systematic evaluation protocol for critically ill pregnant women in South Africa (Lombaard et al., 2005).

High dependency care

Some women experiencing clinical deterioration may require admission to intensive care units whilst others may be suitable candidates for high dependency care (Brace et al., 2004; Billington and Stevenson, 2007). High dependency care has been identified as an intermediate level of care between the intensive care unit and the ordinary ward setting (Audit Commission, 1999), and viewed as a means of relieving the workload on intensive care units (Kilpatrick et al., 1994). Women may receive high dependency care in a general high dependency unit or in the maternity unit setting. Maternity units may have a dedicated maternity high dependency unit or there may be designated high dependency care beds situated within the labour ward (Cordingley and Rubin, 1997; Tsung cited by Lee, 2004; Baskett, 2008). The provision of high dependency care within the maternity unit setting has been positively evaluated by healthcare professionals in terms of bringing the requisite obstetric and critical care expertise together and promoting continuity of care for women and their families (Antony and Johanson, 1996; Ryan et al., 2000; Saravanakumar et al., 2008).

There are large amounts of data identifying the numbers of women who are admitted to intensive care units for obstetric reasons (Baskett, 2008). A study by Harrison et al. (2005) calculated that obstetric patients account for 0.9% of all admissions to intensive care units in the UK. In contrast, there is a relative paucity of data relating to the numbers of women who require maternity high dependency care. Difficulties in data collection may be attributed to the exclusion of labour wards from critical care datasets and the lack of precise definition for maternity high dependency care. Whilst maternity units may retrospectively collect data on women surviving maternity high dependency care through clinical incident reporting mechanisms, these systems rely upon professionals identifying the need to report and the organisational procedures and processes to facilitate this (Department of Health and NHS Executive, 1997; Department of Health, 2000a; NHS Litigation Authority, 2007). Data obtained over a decade ago in North Staffordshire identified that 'just under 1% of women' received maternity high dependency care (Antony and Johanson, 1996), whilst a recent study conducted in a large tertiary referral obstetric unit identified that 5.1% of all women required maternity high dependency care (Saravanakumar et al., 2008). This large proportion of women has been attributed to the increasing numbers who experience high-risk pregnancies and have complex care requirements (Saravanakumar et al., 2008); however, it is unclear whether the variation between the two data sets may also reflect local case mix.

It has been recommended by the Royal College of Anaesthetists et al. (2007) that high dependency care provided within maternity

units is flexible and responsive to the needs of local populations, and 'provision should be made for up to 10 high-dependency cases/1000 births/year'. This report emphasises that:

all obstetric units should be able to provide some high-dependency care, including cardiovascular monitoring, pulse oximetry and rapid transfusion of fluids or blood.

However, over and above these recommended minimum requirements, what actually constitutes maternity high dependency care appears to vary. There may be differences between maternity units regarding the available equipment and facilities (Cordingley and Rubin, 1997), the predetermined admission criteria used (Lee, 2000; Billington and Stevenson, 2007) and the expertise of the staff providing the high dependency care (Bench, 2007). The education and training that midwives receive in order to undertake this type of care will be determined locally and differ between maternity units (Bharj and Nolan, 1999; Billington and Stevenson, 2007; Edwards, 2008).

Maternity high dependency care is a complex and multifaceted entity (Fig. 1) and, as recent reports emphasise, it is vital that maternity services are able to provide this type of care safely and to a high standard (Darzi, 2008; Department of Health, 2008; King's Fund, 2008). Concern has been voiced by Edwards (2008) that national standards governing the provision of maternity high dependency care are lacking and this deficit has the potential to result in adverse clinical events. However, the recent publication of 'Standards for Maternity Care' (Royal College of Obstetricians and Gynaecologists, 2008), intended to promote 'equitable high quality services across the UK', may contribute in part towards rectifying this deficit. Standards related to staffing, communication, training and professional competence within maternity units are included in this document, together with clinical standards, such as the care of women with pre-existing medical and pregnancy-related conditions. A recent audit of local services has shown that women with pre-existing diabetes have a higher risk of requiring maternity high dependency care or admission to an intensive care unit (James et al., 2008).

A review of adult critical care services by the Department of Health (2000b) entitled 'Comprehensive Critical Care' suggested that the terms 'intensive care' and 'high dependency care' should be replaced with a classification system focusing on 'the level of care that individual patients need regardless of location'. This shift of focus was also reflected in the earlier development of the Augmented Care Period dataset (Department of Health and NHS Executive, 1997), enabling identification of patients requiring higher levels of care outside of critical care intensive care and high dependency care units. Subsequent guidance pertaining to the levels of care classification system (Table 1) was provided by the Intensive Care Society in 2002 and again in 2009 (Intensive Care Society, 2002, 2009). Within nursing, the Intensive Care Society's levels of care (Intensive Care Society, 2002) have been incorporated in a tool to measure patient 'acuity and dependency' and monitor workload (Harrison, 2004). An analysis of the levels of care that are provided within maternity units may be influential when reviews of staffing levels are undertaken and bids for additional resources are made. A review of the literature highlights some maternity units utilise the Intensive Care Society's classification system as recommended in the 2004 Confidential Enquiries into Maternal Deaths Report (Lee, 2004; Lewis, 2004); however, there are no published data reporting the extent of implementation across maternity units in England. Furthermore, there are no available data identifying the numbers of midwives who are familiar with and use the levels of care classification system, or the impact that the use of this



Fig. 1. The multifaceted nature of maternity high dependency care (MHDC).

Table 1
The Intensive Care Society's levels of care (2009).

Care level	Description
Level 0	Patients whose needs may be met through normal ward care in an acute hospital
Level 1	Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with advice and support from the critical care team
Level 2	Patients requiring more detailed observation or intervention including support for a single failing organ system or postoperative care and those 'stepping down' from higher levels of care
Level 3	Patients requiring advanced respiratory support alone or basic respiratory support together with support of at least two organ systems. This level includes all complex patients requiring support for multi-organ failure

classification system may ultimately have upon maternal and neonatal outcomes.

The varying terms that may be used to refer to maternity high dependency care, including intensive care, obstetric high dependency care and special nursing care (Yeadon et al., 2001; Male et al., 2002; Baskett, 2008), have the potential to promote misunderstanding and confusion amongst clinicians, highlighting the urgent need for uniformity of terminology. Use of the validated Intensive Care Society's levels of care definitions may go some way to addressing this problem.

Applying the levels of care within the maternity unit setting

Level 0 criteria

When considering the Intensive Care Society's criteria for level 0 care, the care provided in maternity units on antenatal, postnatal and labour wards does not easily equate with the 'normal ward care' provided for patients in an acute hospital. This is not surprising given that patients in acute hospitals are typically ill or awaiting medical or operative interventions. It could be argued that an alternative 'maternity-specific' level 0 category should be developed

that takes into account care that is now classed as 'routine' received by women in maternity units. However, as there are currently no accepted definitions for the word 'routine' in this context, examples of midwifery-specific level 0 care for women receiving care during the antenatal, intrapartum and postnatal periods are suggested in Table 2. These examples do not comprise a complete and definitive list, but intend to stimulate professional debate around what constitutes 'routine' care in contemporary practice.

Level 1 criteria

Epidural analgesia is currently identified as level 1 care and is an example cited by the Intensive Care Society (2002). However, epidural analgesia has become an accepted and a frequently used form of intrapartum pain relief in maternity units (Healthcare Commission, 2008), and it is proposed that women who receive epidural analgesia during labour for the sole purpose of pain relief should not be classed as receiving level 1 care on the labour ward.

When considering the overarching statements that define level 1 care it would appear that two of the three criteria can be applied directly to maternity care. However, the criterion 'patients in need of additional monitoring/clinical interventions, clinical input or advice' (Intensive Care Society, 2009) for this level requires clarification when considering the complex intrapartum care that is often provided routinely for women who are classed as being 'high risk' due to the presence of pre-existing medical disorders such as diabetes, hypertension or cardiac disease (National Institute for Health and Clinical Excellence, 2008). It is proposed there is a need to develop maternity-specific examples (Table 2) that will enhance the understanding of this level 1 statement, and assist in ensuring that women receiving level 1 care are appropriately classified.

A study undertaken in an acute general hospital ($n=351$ patient) based on the Intensive Care Society's (2002) levels of critical care for adult patients concluded that level 0 and level 1 adult patients were difficult to distinguish when using tools such as the early warning signs to assess patient acuity (Morris and Simpson, 2007). The researchers stated that 'the Intensive Care Society criteria fail to offer distinct definitions for these two groups'. Therefore, it is theorised that there may also be a blurring between professionals' perceptions of levels 0 and 1 care in

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Table 2
Examples of midwifery specific level of care.

Nursing		Midwifery	
Level 0 criteria (Intensive Care Society, 2009)	Examples of level 0 care (Intensive Care Society, 2009)	'Proposed' criteria for 'maternity' level 0 care	Proposed examples for 'maternity' level 0 care
Patients who require hospitalisation but whose needs may be met through normal ward care in an acute hospital	<ul style="list-style-type: none"> • Intravenous therapy • Observation required less frequently than four-hourly 	<p>Antenatal</p> <ul style="list-style-type: none"> • Pregnant women whose clinical needs can be met on the antenatal ward of an obstetric unit <p>Intrapartum</p> <ul style="list-style-type: none"> • Women whose intrapartum needs can be met through 'routine' care on the labour ward of an obstetric unit <p>Post partum</p> <ul style="list-style-type: none"> • Women whose clinical needs may be met on the postnatal ward of an obstetric unit 	<ul style="list-style-type: none"> • Obstetric, medical or fetal complications requiring non-invasive monitoring (e.g. temperature, pulse, blood pressure, respiratory rate, pulse oximetry) and urinary output monitoring less frequently than four-hourly • Antenatal acute obstetric admission^a with reassuring MEOWS scoring • Healthy woman in labour at term^b • Epidural analgesia for pain relief during labour^c • Pre-term labour in otherwise healthy woman • Healthy woman in labour^b with fetal complications. • The presence of obstetric or medical conditions requiring non-invasive monitoring (e.g. temperature, pulse, blood pressure, respiratory rate, pulse oximetry) and urinary output monitoring less frequently than four-hourly during the postnatal period • Postnatal re-admission with reassuring MEOWS scoring
Level 1 criteria (Intensive Care Society, 2009)	Examples of level 1 care (Intensive Care Society, 2009)	'Proposed' criteria for 'maternity' level 1 care	Proposed examples for 'maternity' level 1 care
Patients recently discharged from a higher level of care	<ul style="list-style-type: none"> • Patients requiring a minimum of four-hourly observations 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • Women transferred from the intensive care unit to the labour ward for continued monitoring and treatment
Patients requiring critical care outreach service support	<ul style="list-style-type: none"> • Abnormal vital signs but not requiring a higher level of critical care 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • As per Intensive Care Society (2009) • Women at risk of clinical deterioration and the possible need for level 2 care
Patients in need of additional monitoring/clinical interventions, clinical input or advice	<ul style="list-style-type: none"> • Epidural analgesia or patient-controlled analgesia in use • Requiring a minimum of four-hourly observation on the basis of clinical need • Patient requiring bolus IV drugs through a central venous catheter • Patients requiring continuous oxygen therapy • Patients receiving parenteral nutrition 	<ul style="list-style-type: none"> • To remain the same as for nursing 	<ul style="list-style-type: none"> • Women requiring epidural analgesia or patient-controlled analgesia on the postnatal ward • Presence of pre-existing medical and/or obstetric complications requiring: <ul style="list-style-type: none"> Non-invasive haemodynamic monitoring less than four-hourly Acute obstetric admission^a with non-reassuring MEOWS score • Women requiring bolus IV drugs through a central venous catheter • Administration of boluses of IV fluids/blood products/IV medications and/or requiring continuous oxygen therapy • Requiring regular clinical input from the obstetrician/obstetric anaesthetist/additional specialist(s)

MEOWS, modified early obstetric warning systems; IV, intravenous.

^a Lewis (2007).

^b National Institute for Health and Clinical Excellence (2007).

^c Healthcare Commission (2008).

maternity units where increasing numbers of women are classed as being 'high risk' and require complex care (Bench, 2007; Lewis, 2007; Robson and Waugh, 2008).

Level 2 criteria

The Intensive Care Society's (2002) criteria for level 2 care are clearly defined (Morris and Simpson, 2007), as are the revised

2009 criteria. Level 2 care may be initiated on the labour ward (Lewis, 2007; Royal College of Anaesthetists et al., 2007), an example of this care being a woman who has suffered a major postpartum haemorrhage and is receiving treatment for associated hypovolaemia. Whilst some maternity services will continue to provide level 2 care on the labour ward (Bence, 2009), others may transfer women to the intensive care unit; detailed consideration of this level of care is beyond the remit of this paper.

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In relation to the levels of care classification system, future research is required to answer the questions:

1. How frequently are the Intensive Care Society's 'levels of critical care for adult patients (Intensive Care Society, 2009) used in the maternity services by midwives, obstetricians, anaesthetists and the wider multi-disciplinary team in their current format?
2. What modifications and adaptations to the Intensive Care Society's levels of critical care for adult patients (Intensive Care Society, 2009) are required for use in the maternity care setting?

Midwife preparation

The area of critical and high dependency care in a midwifery care setting is complex. Midwives are well equipped to assist in the normal birthing process, but may require additional skills to facilitate the care of women requiring specialist care. The ongoing education and training of professionals through courses such as acute life-threatening events, recognition and treatment, immediate life support and advanced life support are recommended as a means to facilitate midwives' acquisition of these skills (Smith, 2003; Lewis, 2007; Resuscitation Council UK, 2008). A multi-disciplinary team approach to training is paramount (Royal College of Obstetricians and Gynaecologists, 2008).

Conclusion

More women are embarking on pregnancy with pre-existing medical conditions that may cause them to require specialist care. Whilst attention has shifted globally to examine severe maternal morbidity as well as mortality, this shift also needs to include women who may be moving, undetected, along the morbidity-mortality continuum. It is suggested that midwives have a unique role to play in the multi-professional team in the identification and care of women who are developing or have developed critical illness. Those midwives providing critical care in the maternity unit setting are also ideally placed to provide the crucial psychosocial aspects of care that women and their families require, thus upholding many aspects of the 'philosophy and model of midwifery care' embodied by the International Confederation of Midwives (2000).

The addition of appropriately adapted track and trigger systems to sound clinical judgement may be a useful approach to enable earlier detection of women who require additional clinical input and treatment. The terminology for and meaning of the term 'high dependency care' varies between maternity units, and adoption of the Intensive Care Society's classification system may assist in promoting uniformity. However, the development of a 'maternity-specific' level 0 care category for those women requiring admission to obstetric units is advocated. Moreover, specific examples which promote clarification in terms of the level 1 headline statement 'patients in need of additional monitoring/clinical interventions, clinical input or advice' (Intensive Care Society, 2009) are required to ensure that women receiving level 1 care on the labour ward are not inadvertently perceived as receiving level 0 care. This is an area of clinical practice which requires further debate and research.

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Women with pregnancies complicated by pre-existing diabetes: a risk factor for high dependency care?

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Aims: Diabetes is the commonest medical condition affecting pregnant women. There is well documented evidence of an increased risk of maternal morbidity in this cohort. This study aimed to investigate if healthcare professionals (HCPs) classified women with pregnancies complicated by diabetes as requiring high dependency care (HDC).

Methods: A three-round Delphi study conducted in seven maternity units including 14 professional titles comprising the expert group were asked 'What constitutes HDC in maternity units?'

Results: The Round One (R1) questionnaire response rate was 85 (44%) and represented all professional groups; 21 respondents identified diabetes as a condition where women may require HDC with comments such as 'Diabetic mother poorly controlled despite sliding scale'. In Round Two (R2), respondents rated (on a five-point Likert scale) how strongly they agreed or disagreed with statements from R1; response rate 87%, n = 85. Scores were aggregated to give a median score ranging from 1 (strongly disagree) to 5 (strongly agree). The statement 'Unstable diabetes is a condition requiring HDC' scored a median of 4 with 94.6% of participants strongly agreeing/agreeing with the statement. The strong consensus recurred in Round 3 (response rate 90.5%, n = 67) with a median score of 4 and 92.5% of respondents strongly agreeing/agreeing.

Conclusions: The need for extra surveillance and the requirement of higher levels of care for women with pregnancies complicated by diabetes was identified by HCPs. The increased risk of maternal morbidity associated with poorly controlled pre-existing diabetes was cited as a major risk factor for patients needing HDC.

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Abstract Factors affecting the threshold transfer of sick parturients to higher levels of care

INTRODUCTION. Current maternal mortality rate directly or indirectly due to pregnancy in the United Kingdom currently stands at 11.39 per 100,000 maternities (CMACE, 2011) and suboptimal care is frequently identified as a contributing factor in these deaths. The appropriate and timely escalation of care for maternity patients is vital in order to ensure they receive the appropriate level of care and have safe clinical outcomes (CMACE, 2011). This may include the need for maternity high dependency care (MHDC), transfer to an intensive care unit (ICU) or other specialist unit. The thresholds at which transfers to higher levels of care happen appear variable (Maternal Critical Care Working Group, 2011).

OBJECTIVES. The aim of the research was to determine what constitutes high dependency care in the maternity unit setting.

Research questions:

1. How do clinicians define MHDC?
2. Is there any difference in the definition of MHDC between professional groups?
3. Does the size and type of hospital / maternity unit influence the definition of MHDC?

METHODS. A three-round Delphi study was used to seek consensus across experts currently involved either directly/indirectly in the provision of/transfer to MHDC. Participants were drawn from seven maternity units in the UK, birth rates ranging from 1700 to 5000. Sixty-seven doctors and midwives completed all 3 rounds. Responses to a question about what constitutes MHDC (Round 1) were grouped into themes and participants rated agreement on a 5 point Likert scale (Round 2). Statements that didn't achieve consensus were presented again in Round 3, and participants were also asked if they were familiar with the UK Intensive Care Society levels of care.

RESULTS. Four themes were identified in R1 (conditions, vigilance, interventions and service delivery), common across anaesthetists, obstetricians and midwives. However, midwives were more likely than doctors to request ICU admission for continuous ECG monitoring (63.3% v 36.4%) and arterial line monitoring (73.5% v 53.1%). Smaller maternity units were less likely to provide MHDC and had a more liberal policy of transferring women to ICU. Qualitative comments indicated that a lack of necessary equipment, facilities and skilled midwifery staff were contributing factors. The extent of familiarity with the ICS levels of care (14.3-57.1% familiarity) tended to correspond with the size of Unit (1700-4500 birth rate).

CONCLUSIONS. Whilst it may be seen as accountable and safe practice, this 'early' escalation of care to intensive care or HDC has workload implications for ICUs and may also impact on the bonding process between the mother and her baby.

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Factors that influence midwives' escalation of care decisions; a focus group study

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Background The appropriate and timely escalation of care (EoC) is vital in ensuring that women have safe clinical outcomes. EoC may involve advice from critical care outreach or transfer to a critical care unit. Currently, there is limited evidence examining the factors that influence midwives' decisions to request care escalation.

Objectives To examine how patient factors, local service organisation and professional issues impact on midwives' care escalation decisions

Methods The study was conducted across three Obstetric Units in the South West of England. The Obstetric Units were chosen for their differing annual birth rates (1700, 4000, 5000). Three simulated clinical scenarios were used as triggers for focus groups (severe pre-eclampsia, major postpartum haemorrhage with CVP line and undiagnosed chest pain requiring facial oxygen and continuous ECG monitoring). Two focus groups were conducted in each of the maternity units, one with band six and one with band seven midwives. The focus group transcripts were analysed using a framework analytical approach.

Results Fixed influences included the proximity of the Labour Ward to specialist areas such as Critical Care and the availability of equipment required to care for acutely ill women. The midwives working in the smallest unit had low thresholds for requesting the transfer of women off the Labour Ward, as they did not have the requisite equipment (or expertise) to care for women with invasive monitoring and continuous ECG monitoring.

Variable influences that impacted on midwives' EoC decisions included midwifery staffing levels, skill mix and workload on the Labour Ward. Some (but not all) midwives from the larger units provided level two care, but enlisted support from the Critical Care Outreach team, Anaesthetist or Operating Department Practitioner. The presence of cohesive multidisciplinary team working was a key factor in midwives' EoC decisions.

Obstacles to care escalation included 'pregnancy' where professionals working in other specialties were reluctant to admit pregnant women. Professionals' misconceptions regarding the role of the midwife, negative professional relationships, delays in obtaining external support (e.g. physicians) and limited bed availability on specialist units such as critical care were also viewed as obstacles to EoC.

Conclusion Whilst the findings of this qualitative study are not generalisable, they provide insight into the factors that influence midwives' decisions to request the escalation of care. Where there are disagreements about, or impediments to EoC, the potential for adverse incidents is increased and clear guidelines are required.

Poster presentation Royal College of Midwives



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Do Midwives and Doctors agree on the features that define Maternity High Dependency Care?

Background

Some women become acutely unwell during pregnancy and require maternity high dependency care (MHDC). Underpinning safe MHDC provision is the necessity for cohesive multidisciplinary team working by professionals who possess the necessary expertise and have a mutual understanding of what this care entails (Maternity Critical Care Working Group, 2011).

Study Aims

The overarching aim of this study was to determine what constitutes maternity high dependency care. A second aim (reported here), examined whether the defining features of MHDC were the same for midwives and doctors working in Obstetric Units (OUs) with similar birth rates.

Methods

A three-round Delphi survey recruited Midwives, Obstetricians and Anaesthetists from seven OUs in Southern England. These professionals formed three OU groups with similar birth rates (group one 3300/3300 births, group two 4000 / 4500 births, group three 1500/1700/2200 births). The round one questionnaire gathered qualitative data that were analysed and informed the development of the subsequent two questionnaires. The second and third round questionnaires consisted of a series of statements against which, respondents were asked to rate their level of agreement on a 5 point Likert scale (1= strongly disagree, 5=strongly agree). The level of consensus was set at $\geq 80\%$ for the combined percentage of agree / strongly agree statements. During round three, the respondents also answered fifteen questions examining when intensive care may be indicated in preference to MHDC. Each postal questionnaire was piloted before distribution and ethical approval was obtained.

Results

35 of the 67 professionals who returned all three questionnaires were midwives. The round one response rate was 44% (85/193). The midwives and doctors were evenly distributed across the three OU groups. There was consensus agreement between the professional groups regarding many conditions, monitoring and interventions that were defining features of MHDC. Nonetheless, differences of opinion were apparent. For example, the midwives of groups one and two achieved consensus agreement that prolonged post-operative recovery and step-down care were indications for MHDC, whilst the doctors did not. The midwives of group 3 achieved consensus agreement that women requiring continuous ECG monitoring / neurological observations, arterial line monitoring, fluids administered via central line, and oxygen therapy $> 50\%$ concentration should receive intensive, as opposed to MHDC, but the doctors did not.

Conclusions

A positive finding of this study was the consensus agreement between midwives and doctors about many characteristics of MHDC. Nonetheless, professional disagreements and lack of consensus about some features of MHDC did exist; these may constitute 'gaps' in terms of patient safety, and increase the likelihood of adverse incidents occurring (Cook, Render and Woods, 2000). Service providers must assess the feasibility of midwives in OUs with lower annual birth rates (e.g. those in group three), becoming skilled and maintaining competencies in rarely encountered aspects of MHDC provision such as invasive monitoring. Clear local guidance, escalation protocols and multidisciplinary training are required to ensure that midwives and doctors work cohesively to provide safe care for acutely ill women.

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